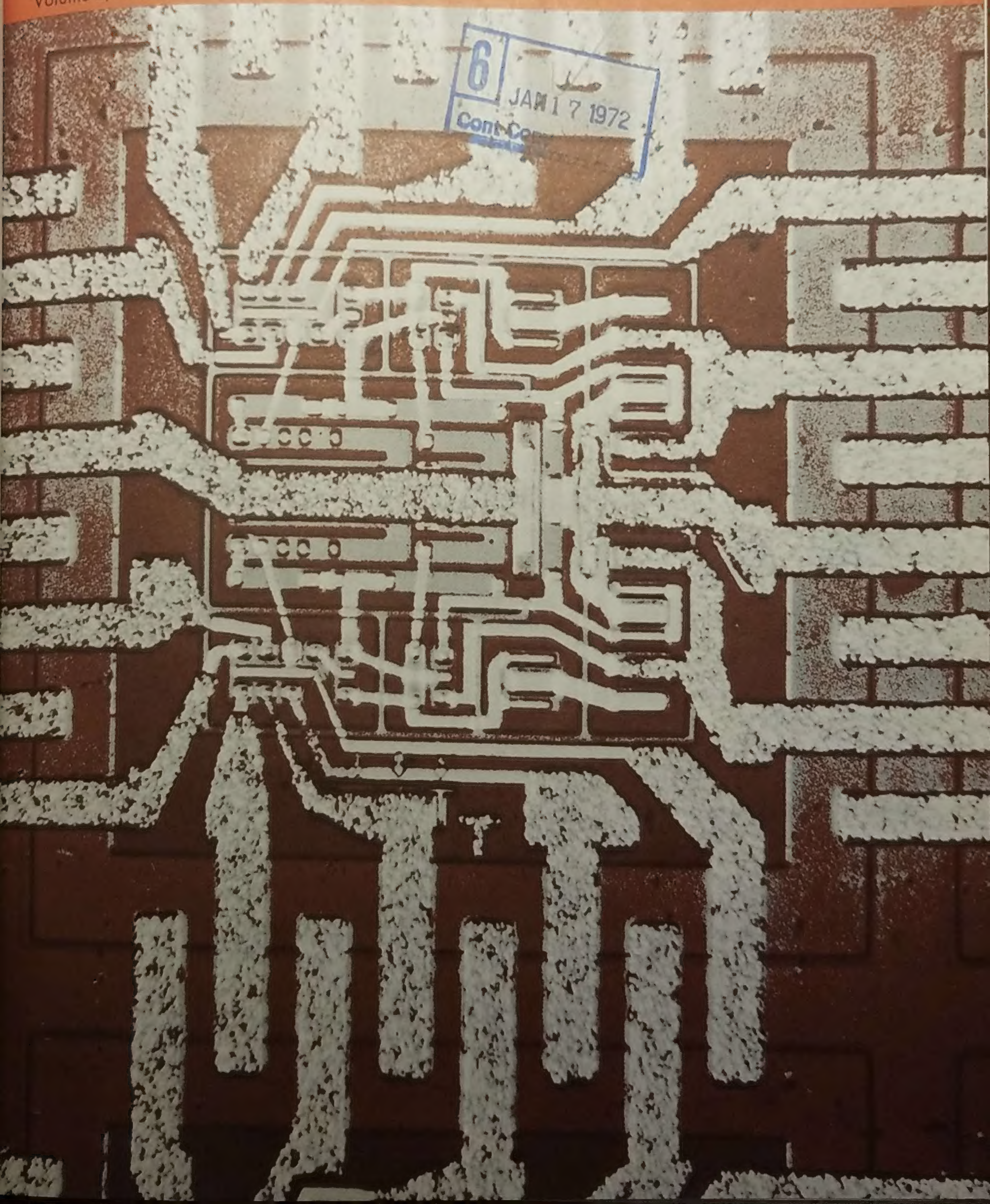
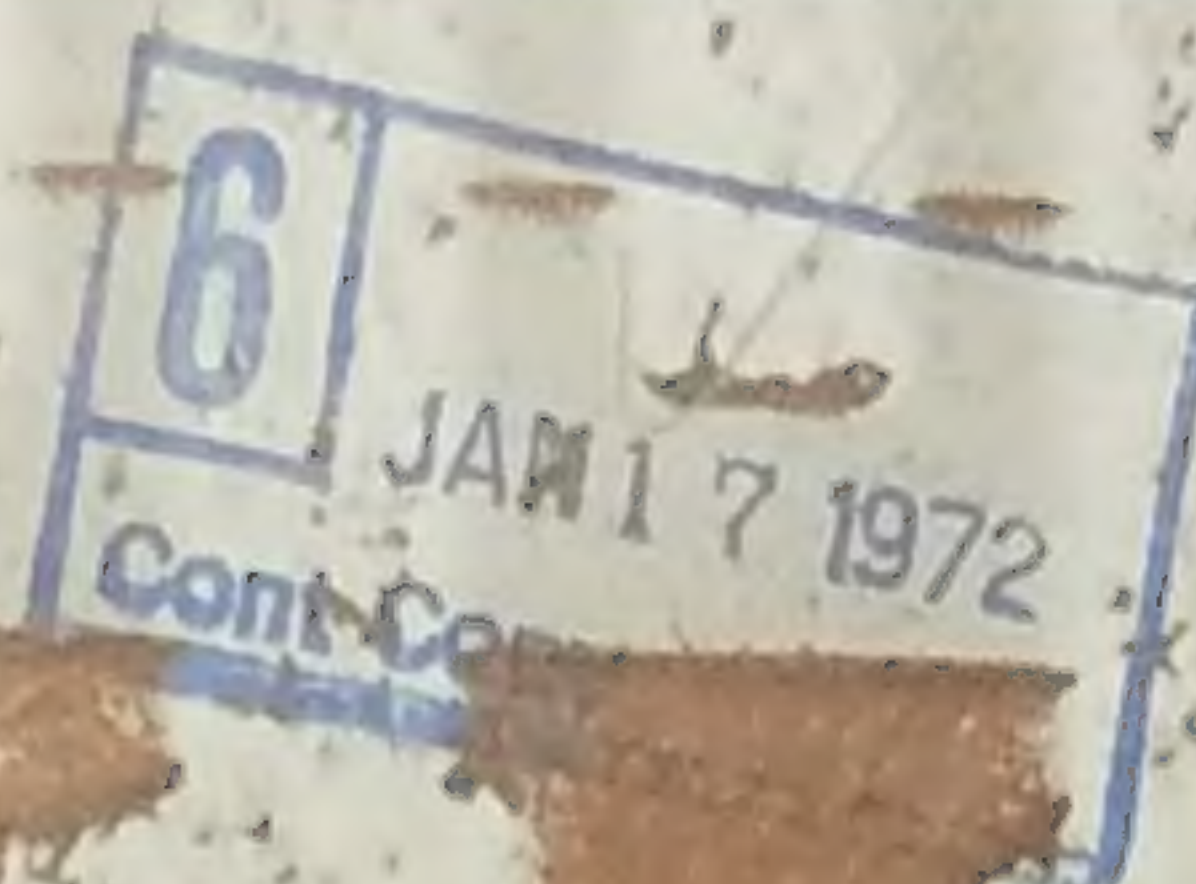


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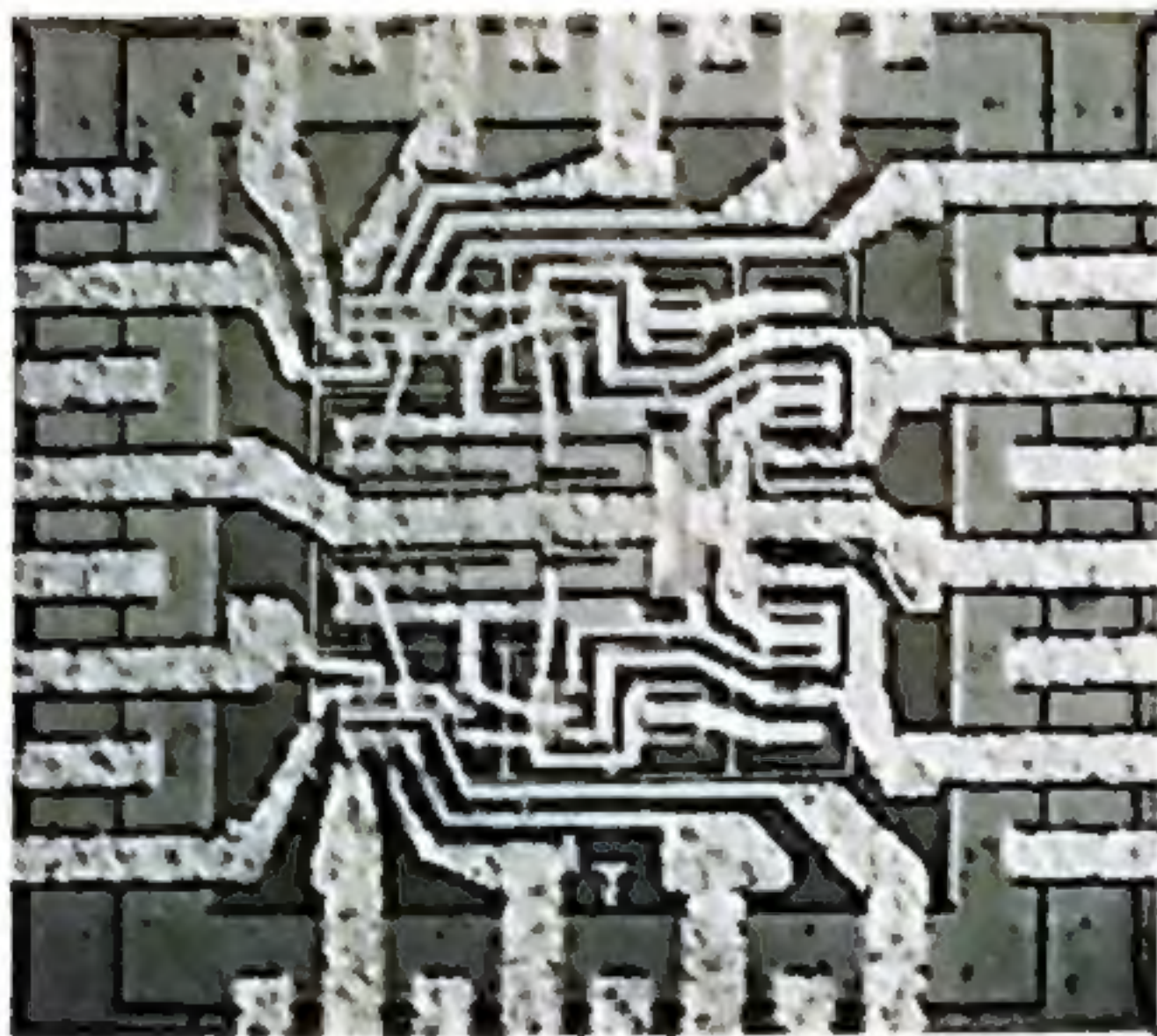
# EDUCOM

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## On The Cover

Lilliputian integrated circuits—specks of crystal that carry complete arrays of electronic components—are making the miniaturization of digital computers increasingly possible. Photomicrograph shows a single beam-lead circuit which was developed by Bell Telephone Laboratories. Although it includes 10 transistors, 18 diodes, and 12 resistors, its actual breadth is only .053 inch from beam tip to beam tip.

### EDUCOM

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# EDUCOM's Position on Copyright Changes

*In order to devote as much space as possible to a matter of enormous importance to higher education, the proposed new Copyright Act now before Congress, EDUCOM has abandoned for this issue its usual illustrated format. The following resolution was approved unanimously by EDUCOM Trustees and representatives to the Council, who emphasized, however, that their action did not bind member universities.*

With the purpose of securing (a) a proper adjustment of the interests of authors, publishers, and educational users, and (b) a proper contribution of the computer to the educational life of the nation, we recommend that the current version of the Copyright Revision Bill (S. 597, 90th Congress, First Session) be clarified and amended to accomplish the following:

1. Any copyright applicable to a computer program shall not extend to the process embodied in the

program, and a user shall be privileged to replicate the program in order to carry out the process.

2. In accordance with traditional American copyright policy, reasonable exemptions for copyright restrictions shall be allowed to nonprofit educational, research, and library institutions in regard to their utilization of copyrighted works in computer operations. The relevant exemptions provided in S. 597 are not adequate and would seriously hamper educational development in this country.

3. In recognition of the fact that computer technology and utilization are changing at a rapid rate and the effects of copyright regulations in this field are necessarily problematic, S. 597 should provide for appropriate administrative mechanisms by which the law may be rapidly adjusted to meet conditions as they arise.

by BENJAMIN KAPLAN and ARTHUR R. MILLER

## Computers and the Copyright Bill

**W**HEN THE PRESENT COPYRIGHT ACT WAS ENACTED in 1909, phonograph records and motion pictures were in their infancy. Magnetic tape, television, photocopying, communication satellites, and computers were unknown. Moreover, teaching did not involve audiovisual devices or the extensive use of up-to-date copyrighted materials.

Many definitions and concepts in the 1909 Act, which has remained virtually untouched, became increasingly obsolete over the years.

Since 1955, pressure for a complete revision of the Copyright Act has been mobilized, and the matter has undergone considerable study and discussion. The Copyright Office conducted hearings, as, after revision bills were introduced in Congress, did the House and the Senate.

The House passed its Bill, and final Senate action is expected this year, or at the latest, in 1968. Any revision is bound to affect dramatically the work of edu-

cators, computer users, and the authors and users of computer programs.

Although computers are not mentioned in the current Act, it seems certain that whether computer activities infringe on copyrights would be judged by the same standard as other forms of copying and performance. Since the word "copy" is not defined in the present statute, it is unclear how broadly the courts might apply it in situations that involve the use of copyrighted materials in computers.

The Supreme Court once held in another context that before there can be a violation, a person must be able to *read* the "copy." Thus, punch cards, magnetic tape, and other machine-readable versions of copyrighted materials arguably are not infringing "copies."

This decision was rendered more than half a century ago, however, and makes little sense in the light of modern technology. Furthermore, punch cards and magnetic tape can be deciphered by some people just as sheet



music can, meaning that the input of copyrighted materials into a computer might well be considered a "copy" under existing law.

Memory cores and magnetic discs, on the other hand, cannot be read and, if the courts persist in retaining the "susceptible of being read" requirement, would not be "copies."

Computer output in the form of a tangible printout obviously is a "copy" within the meaning of the 1909 Act. If the output consists of sound or a visual display on a cathode-ray tube, probably it would constitute a "performance" under the Act or, in the latter case, a "copy."

THE PROPOSED REVISION OF THE COPYRIGHT LAW CURRENTLY BEING CONSIDERED PROVIDES FOR THE PROTECTION OF

English or ordinary mathematical notation (examples of such languages are COBOL, FORTRAN, and MAD).

AT PRESENT, THE COPYRIGHT OFFICE ACCEPTS COMPUTER programs for registration if the effort that went into them constitutes "original authorship" and the copies "deposited for registration consist of or include reproductions in a language intelligible to human beings." If the program has not been published in a form that can be perceived visually, something akin to a printout must be deposited.

In accepting programs, the Office has made it clear that its policy does not automatically mean that they are copyrightable; that question must be resolved by the courts. No distinction is drawn as to the type of program. Any that meet the standard are acceptable. Flow



Benjamin Kaplan and Arthur R. Miller, cochairmen of the EDUCOM Task Force on Legal and Related Matters, are, respectively, Royall Professor of Law at Harvard and Professor of Law at the University of Michigan. The Royall endowed chair is the oldest at Harvard for legal studies. Both Kaplan (left) and Miller are natives of New York, and each practiced there before becoming a law educator. Kaplan earned an LL.B. from Columbia in 1933. Miller received his law degree in 1958 at Harvard, where he was a student of Kaplan. Each teaches copyright law.



computer programs and the protection of copyrighted programs in computer operations conducted by nonprofit educational, research, and library institutions. EDUCOM believes these provisions in their present form will seriously hamper education. What follows is an analysis of the Bill's impact upon the developing role of computers in instruction and research, and suggestions as to how the Bill could more fairly protect authors and publishers and, at the same time, permit the full application of computers to the advancement of education.

A computer program generally is defined as a set of instructions that directs a computer operation, although the term actually encompasses several different stages in the problem-solving process a computer follows.

Before one can even begin "programming," one must know how to solve the problem presented and be able to express the solution in detailed steps. The sequence of steps leading to the solution often is referred to as the problem-solving "algorithm."

Once one knows how to solve the problem, the algorithm is displayed in terms of logical units that correspond to the capabilities of the machine on which the problem is to be attacked—the "flow chart."

This "flow chart" is transformed into a "source language" program, a problem-oriented language similar to

charts and source programs meet all the requirements and readily fit under the categories of "books" or "technical drawings." But it might be difficult under today's law to acquire copyrights for programs on punch cards or magnetic tape because of the rule that a work must be *readable*.

The Revision Bill would eliminate this uncertainty by extending protection to anything that is in a fixed form and perceivable either directly or with the aid of a machine or device.

Hence, protection would extend to programs on punch cards, tape, or any other medium, with no requirement of intelligibility to the eye. The proposed statute also still requires that works be "original works of authorship," and presumably existing concepts of originality and authorship apply.

There is not much question that Congress has the power to give copyright protection to computer programs. The real issue is, should it?

That computer programs should be protected through copyright is, on its face, a strange proposition. Because programs represent algorithmic plans for using machines to achieve practical results, they are poles apart from the conventional subject matter of copyright, which has historically covered such works as novels,



plays, music, and pictures. Programs differ from more ordinary means of expressing ideas in that one uses the program itself in the execution of the idea.

To use, say, a textbook on cost accounting, one reads the book and then applies the ideas in it to a particular fact situation. To use a source program "explaining" cost accounting, one actually puts the source program into the computer and lets the machine take over. The ideas in the source program can be used only by first converting it into an object program and then using the commands therein to operate upon the fact situation—the raw data.

There was, in fact, very little cogent discussion of computer programs at the meetings under Copyright Office auspices that preceded the submission of draft bills. The same was true of hearings before the Subcommittee which advised the House Judiciary Committee to report a Revision Bill with amendments.

Despite the dearth of discussion or analysis, the Revision Bill, nominally at least, appears to cover computer programs, in all their variety, as subjects of copyright.

Whether on punch cards or tapes or in other forms, programs seem to fit under the Bill's broad definition of copyrightable matter, a definition which includes nearly everything that is associated with authorship and reduced to some fixed arrangement.

Inclusion of computer programs raises the all-important question of the proper scope of protection to be accorded them. Is it intended that the copyright monopoly shall extend to the use of the program in combination with the computer to attain the result at which the program is aimed? For example, is it proposed that the plan or scheme of running a steel mill or handling payrolls by computer shall become the property of the person who holds the copyright on the tapes or punch cards which direct the computer, which in turn directs and monitors the operation?

The Revision Bill does not specifically address itself to this problem, but again we are met with broad statutory language defining the proprietor's exclusive rights. The language could conceivably be read as going the whole length and giving an affirmative answer to the foregoing question—of giving the proprietor of a program the ownership of the process, so to speak, which the program embodies. EDUCOM submits that this possible interpretation should be clearly disavowed.

NO BASIS HAS BEEN LAID FOR LEGISLATION WHICH would take the drastic step of granting monopoly protection to computer programs extending to computer processes. There has been virtually no attempt to examine the economics of the creation or distribution of pro-

grams, starting with the question of practical headstart or time advantage that a program maker may now enjoy without statutory protection. He may secure an advantage by staying abreast or ahead of competition and keeping the program "private" through contract or other arrangements. In fact, the industry has burgeoned without the artificial stimulus of the extensive protection that is contemplated by the Revision Bill.

In principle, the vice in granting copyright to computer programs, in the sense of the process, is that it would amount to giving them a breadth of protection similar to that accorded by patent, but without the safeguards and limitations that rightly surround the grant of a patent.

Monopoly of systems, schemes, and the like has been granted by law in the past only under patent, and only upon proof satisfactory to a governmental agency that there has been a real "invention"—a discovery marking a material advance over prior knowledge. Such a monopoly may last only 17 years. Copyright of a com-

## Bill Threatens Program Field

puter program, on the other hand, would be available on the basis of "originality," that is, merely an absence of copying without regard to true inventiveness. There would be no serious governmental scrutiny in advance; and the protection would run for a lengthy period (the present period is 56 years; the Revision Bill proposes roughly 75 years).

This kind of easy and broad protection would threaten to tie up the computer program field and inhibit its progress. Had there been such a regime for programs, had programming been constantly carried out under the threat of infringement actions charging plagiarism of existing copyrighted programs, it is doubtful whether the recent growth of programs and programming techniques would have been possible.

Imagine the condition if any sizable fraction of the thousands of existing programs were held in copyright, and copying of the processes involved were civilly actionable and even criminally punishable.

The argument has been made in support of, or at least in apology for, copyright for programs covering the processes that infringement could be avoided simply by changing in some degree the sequence of steps or the problem-solving algorithm of the program. In this view, the presence of a copyright would merely compel an outsider to do some slight work of his own in order to stay out of trouble. The answer to this suggestion is: if copy-



right of process were accepted, (1) it would make no sense to permit escape from it by trivial variation; (2) it is very doubtful that courts would take so lighthearted or permissive an attitude toward the infringement question. The recent tendency of the courts has been to enlarge rather than to contract the range of actionable plagiarism. Surely it would be most imprudent to assume that courts would be especially careful about finding infringement of computer programs, once the basis of protection was established.

It should be added here that the question of patent protection for computer programs is being studied by the Patent Office.

That Office recently published and invited comments upon a set of "guidelines" tentatively proposed for passing on applications for computer-program patents under the present Patent Act. The "guidelines" have been criticized as awkward in that the text of the present Act does not envisage computer programs and the "guidelines" cannot overcome this inadequacy. It may be that the Patent Act would have to be amended to deal more directly with programs. In any event, something on the order of patent appears to be the right legal vehicle if it is believed the public interest requires that further encouragement be given to programming by holding out the prospect of substantial monopoly.

IF THE PROCESS EMBODIED IN A COMPUTER PROGRAM ought not to be aggrandized through copyright, it might still seem plausible to allow a narrower copyright of a program. A narrower copyright could confer on proprietors the exclusive right to replicate the instructions themselves, the content of the punch cards, etc., and the right to bar others from replication, thereby compelling others to buy punch cards, tapes, etc. from him. But it becomes evident that this right must be carefully circumscribed. For if, as we urge, the outsider is to be assured full access to the process—full right to practice the art comprised in the computer program—then he must be given the accompanying privilege to replicate the program.

Put another way, were the copyright owner empowered to bar outsiders from replicating his program, he effectively would deny outsiders the ability to practice the art, for the outsider must replicate the program or something akin to it in order to instruct his own computer.

Yet, the copyright owner might be given the right to prevent others from replicating the content of the punch cards, tapes, etc. simply for the purpose of selling the program on the market or reproducing it in a book on programming. In general, it might not be socially harmful to permit copyright of computer programs

limited in scope to replication for purposes other than carrying out the process or practicing the art. Concretely: X prepares a program for controlling the production of steel. A copyright of the program by X (obtained on the basis of "originality") should in no event bar Y, an outsider, from producing steel in the same way, and to that end Y, if he chooses, should be at liberty to replicate X's program exactly. (Of course, Y may prefer to buy the punch cards or tapes from X.)

On the other hand, Y would not be at liberty to replicate X's program simply to sell copies of it to Z; he would not be permitted to enter into a competition with X in any market that may exist for selling the relevant punch cards, tapes, etc. We imagine this sort of limited copyright in X would not be socially harmful, although we frankly do not know whether it would be necessary or useful.

IN THE FOREGOING IT HAS NOT BEEN NECESSARY TO distinguish the position of nonprofit educational or research institutions or libraries, as producers and users of programs, from that of commercial organizations. The issue is one of general principle. For the reasons to follow, though, we suggest that if new legislation allows computer programs to hold copyright, then educational and similar organizations deserve special privileges or exemptions on liberal lines. In no event should those institutions be subject to *injunction* for infringement of programs.

If such institutions are not exempt, they should have the equivalent of a compulsory license on terms of compensation reasonable for institutions of their kind. There

## How to Exempt Educational Uses

is precedent for this no-injunction treatment in certain provisions of the Revision Bill on the use of copyrighted works by community antenna TV systems.

We now turn to the use of "data" as distinguished from programs. As the terms "information storage and retrieval" and "data processing" indicate, information or data can be introduced into computers by being placed in machine-readable form or by some more direct scanning process. They can be manipulated in the computer and can be retrieved (in original or altered form) as hard copies or as transitory images or sounds. What if the material is under copyright? The question centers upon the usage by computers of copyrighted works by  
(Continued on page 8)



# Oettinger: Danger to Teaching and Research

*Anthony G. Oettinger, president of the Association for Computing Machinery, told the Senate Subcommittee on Patents, Trademarks, and Copyrights that the proposed Revision Bill "threatens to cripple severely the very research and the very teaching necessary in order that the 'information storage and retrieval system or any similar device, machine, or process' materialize fully, be understood, and be controllable." Oettinger is a professor of linguistics and of applied mathematics at Harvard. The following is excerpted from his testimony before the Subcommittee:*

I wish particularly to express my wholehearted agreement with the perceptive analysis of the problem provided in the statement submitted by the Interuniversity Communications Council (EDUCOM).

I do not wish to repeat arguments that have already been well made by others, particularly since I am not a lawyer. I should rather like to paint for you a picture of what the pertinent sections of this Bill look like to someone, who, like myself, would be directly affected by the consequences.

For a couple of years now, with the support of the Advanced Research Projects Agency of the Department of Defense, I have been experimenting with the classroom use of terminals linked up via 3,000 miles of New England Telephone, Western Union, and Pacific Telephone lines to a computer system devised by my friend and colleague, Professor Glen Culler, at the University of California at Santa Barbara.

Students in several Harvard courses have used this terminal to solve problems in mathematics and statistics as well as to experiment on the design of the system itself with an eye toward producing a more advanced system.

Several facts immediately stand out: transmission is clearly over more than 100 miles; The time and content of the transmission very clearly and necessarily "depend on a choice by individual recipients in activating transmission." I have therefore already run afoul of two of the conditions by which exemption is limited under Section 110 (2) of the proposed Bill.

It would, moreover, be very difficult for me to know whether or not the system my colleague operates 3,000

miles away had or had not incorporated in it programs that were themselves copyrighted or data that were copyrighted and which, under the spirit of the Bill, had in the first place been illegally introduced into the computer.

I am now planning additional experiments over the next three years in which I expect to combine our new computer system with a variety of films, videotapes, audiotapes, and other technical devices as well as the more conventional devices such as chalk and blackboard, books, technical journals, etc.

In the course of these experiments I expect to peruse, display, copy, and enter into computers a great variety of materials. I have as yet no idea how much of what I buy, rent, borrow, or produce myself I will eventually keep and either use in my classroom, publish conventionally or disseminate by less conventional means now still in the experimental stage.

Under the provisions of the Bill as now conceived, I would have not only to acquire and evaluate materials but, in each instance, before experimenting with them, seek out the owner of a copyright, if any, make formal requests for permission to use the material, pay royalties if any are due, etc. All this before any material could actually be used and, in fact, before I could find out whether or not the material was useful! The delays, the frustrations and the chaos inherent in such a process now seem so formidable that if the Bill were passed in its present form I would be tempted to return to the safer occupation of copying out manuscripts with a goose quill pen.

I am interested in the free development of the science and the engineering of both computer hardware and computer software but, as an author, I am not unmindful of the protection afforded by copyright.

Yet, the logic of permitting someone to cut up his legally purchased copy of a book I have written, paste pieces on file cards and sort these by hand while precluding him from doing the same job by machine escapes me. I am concerned if he makes illegal use of the end product, but surely I have as little right to tell him not to use the labor-saving assistance of a computer as I have to forbid him to delegate work to a research assis-

( C o n t i n u e d o n p a g e 11 )



## More about COMPUTERS AND COPYRIGHT

reproduction, performance, and so forth. Our particular interest is to consider what the Bill should provide if such operations are conducted by nonprofit schools or similar institutions.

There has been comparatively little experience with, or practical application of, these computer uses. The range of eventual uses, as well as the technology for accomplishing them, still is largely a question mark.

The traditional policy of our Copyright Act has been to exempt public performances of nondramatic literary and musical works from copyright restrictions when the performances are carried on without a motive of profit. By interpretation, the nonprofit public display of works probably is similarly exempt. These "traditional exemptions" are intended to benefit educational and other such institutions.

Two points need stress. First, these exemptions do not imply that educational institutions or libraries are relieved of all copyright tolls. In fact, these establishments pay vast and ever growing sums for copyrighted works. Consider, for example, the size of the expenditures for copyrighted books. Regardless of the final fate of the computer, there is no prospect of any slackening of such financial contributions in the foreseeable future. On the contrary, education and associated endeavors will be paying more, not less, for copyrighted works.

Second, the traditional exemptions, so far as they favor education and similar undertakings, are not a sentimental or quixotic or irrational kind of largesse which the law unjustly forces copyright proprietors to bestow. Rather they are grounded in enlightened policy.

The law helps to assure an adequate and lively production and distribution of intellectual works by enhancing artificially the returns from distribution. But it serves no public purpose, and is indeed pernicious, to attempt undue enhancement of those returns. Thus, the monopoly rights conferred by the law should be held in reasonable check both as to scope and duration.

It is peculiarly fitting that the outer limits of the copyright monopoly should be drawn to benefit education and libraries. Not only is education intrinsically worthy of encouragement but it creates and constantly enlarges the very audience upon which the copyright industries depend for their market, besides helping to supply the authors who furnish the basic material for those industries.

Also, it may be observed that since funds for education always are running short, schools would tend, if the traditional exemptions were withdrawn, to avoid the performance and display of copyrighted works when possible and turn to works which could be used without

compensation. This might both affect undesirably the selection of works and reduce the profits that the publishers hope to achieve through withdrawal of the traditional examples. The copyright industries—the "publishers" in the broad sense—seem to have gotten along rather well under the long-standing statutory arrangements granting traditional exemptions. Nevertheless, the publishers have insisted throughout the evolution of the Revision Bill on erasing these exemptions.

Sometimes this insistence has been so strident as to disregard the plain fact that the publishers are themselves the beneficiaries of like preferences, whether these take the form of postal subsidies, appear in the guise of public funds appropriated directly or indirectly for the purchase or licensing of copyrighted works, or take the shape of the copyright status which confers on them the basic monopoly.

When the revision effort began, the register of copyrights advised that the traditional exemptions be continued. But, amid a great welter of propaganda, the register has gradually swung around. The result is that the Revision Bill abandons the old line and substitutes particularistic exemptions of narrower scope. As we shall see in more detail, the cutting down of the traditional exemptions operates with special strictness and with serious effect on schools and libraries desiring to use the advanced technology represented by the computer.

THE PUBLISHERS ARE UNDERSTANDABLY CONCERNED that computer operations by schools and libraries may radically change the impact of the traditional exemptions. For example, if "displays" by computers eventually become facile enough to reduce the need for books, the book publishers might be harmed by the operation of the relevant traditional exemption, at least until they could adjust themselves and find a place in the new technology.

But the future of computer uses of copyrighted works by schools and the like is uncertain, and is likely to remain so for some time. A repressive attitude, written into permanent legislation, might prove stultifying.

Moreover, the narrowing or elimination of the traditional exemptions, forcing schools and libraries to seek "clearance" of rights on payment of fees, is and must for some time remain impracticable in the absence of clearing-house devices (apart from those available for music) for negotiation of permissions and fees.

In these circumstances, it would have seemed advisable for the Bill to hew to the line of the traditional exemptions, but to establish a procedure for reviewing and resolving the question when the shape of the future could be better discerned. This might have involved the establishment of an administrative body with appropriate



delegated power, or some other self-corrective mechanism. The Revision Bill does not adopt this approach.

IF FIRM DECISIONS ARE TO BE MADE NOW IN THE NEW legislation, then the particular dispositions of the computer questions should be thoroughly reconsidered.

They were little debated before they emerged in the Bill, and were reached by guess and by hunch. They seem to eliminate virtually all preference for educational institutions that utilize copyrighted works by means of computers.

Assuming that the exact line of the traditional exemptions is to be abandoned, and concessions made to publishers, it still appears that the Revision Bill goes too far and makes undue concessions. In effect, it would give the publishers the economic benefits promised by the future improvement of computer technology. Plainly those economic benefits should be equitably shared, not delivered to the publishers alone.

This one-sided appropriation is especially unfair when it is realized that publishers as a group are no more to be credited with the creation of the technological improvements than are schools and libraries.

Examining the Revision Bill in detail, we find that the exemptions granted to schools and libraries for computer operations with copyrighted works have been reduced to the point at which they are nominal rather than real.

THE BILL WOULD ALLOW AN EXEMPTION FOR "performance" or "display" of copyrighted works by instructors or pupils in face-to-face teaching in nonprofit schools when carried out in classrooms or similar places devoted to instruction.

The meaning of this is not clear. The text of the section, the commentary in the House Report, and the history of the provision suggest that the draftsmen had in mind only performances and displays by means of the projections long familiar in classrooms, and not computer-assisted classroom performances.

A question also is raised whether the exemption, if applicable to computer-assisted instruction at all, covers only cases where the images and sounds are delivered simultaneously to all students in a classroom, and not those where the signals are called forth by individual students at their own rates of speed.

Loss of the face-to-face exemption where there is individualized activation of the machine would be unfortunate, for this element is often the essence of instruction by computer and may be its cardinal advantage. The confinement to the "classroom" and the requirement that an instructor be present run against the healthy trend of the new methods designed to break the stultifying limi-

tations imposed by classrooms. Finally, and very important, the face-to-face exemption is rendered largely nugatory if a "transmission" is involved, *i.e.*, if the images or sounds are received beyond the "place" from which they are sent. If the computer is located outside the "place" in which the classroom is housed (and why should it not be?) presumably there is an infringement, subject, however, to the possibility that the very narrow "transmission exemption" may apply.

THE "TRANSMISSION EXEMPTION" IN THE BILL THE Senate is considering covers the transmission of nondramatic literary or musical works or display, if these are part of the systematic instruction of a nonprofit school, and the radius of the transmission is not more than 100 miles.

The transmission must be made primarily for reception in classrooms or similar places, and the time and content must be controlled by the transmitting organiza-

## Geographic Limit On Transmission

tion and "not depend on a choice by individual recipients in activating transmission from an information storage and retrieval system or any similar device, machine or process."

Obviously this exemption was drafted with educational television in mind. The reference to computers, with the provision against individual activation, appears to have been thrown into the latest version of the Bill as a kind of appendage.

The effect, however, is virtually to read this exemption out of the Bill as it would apply to computerized instruction.

Reflexively it also does great damage to the face-to-face exemption when the computer is at a distance from the classroom.

As already noted, individualization (activation by recipients at their own speeds) is vitally important to computerized instruction, and this falls outside the exemption.

Again the reference to classrooms is too confining. Finally, it is arbitrary to speak of a fixed radius of transmission (presumably to be measured as the distance between the computer proper and its console or terminal facility). The exemption's evident bias against computer "networks" is unexplained and hard to justify.

Although the Bill passed by the House is more liberal concerning educational television, in that it does not limit the radius of transmission, it excludes the use of com-



puters from the exemption and thus has the same practical effect as the Senate Bill.

It will be noted that the two exemptions so far considered relate to teaching. There is no specific exemption for research or library activities by means of computer, an omission that would have drastic effects. Take libraries. Today a library of course pays for the books that are found on its shelves, but ordinarily neither the library nor the reader must make any additional copyright payment to use them, whether by simple perusal on the premises or in lending out. (The register of copyrights has refused to support any toll for lending out.)

The Revision Bill would introduce a diametrically opposite principle by which even intermittent displays of books through machines in libraries might be infringements. This 180-degree turn of position is, in our view, not defensible. The indeterminate "fair use" provision is not an acceptable substitute for a clear-cut and reasonably delimited exception.

SUCH NARROW BENEFITS AS THE EXEMPTIONS WOULD otherwise confer appear to be frustrated by the proposition, advanced in the House Report, that the "input" of a copyrighted work into a computer—involving its translation into machine-readable form—is itself an infringement regardless of the manner of the input or the further utilization of the work.

An infringement thus may occur at the moment a copyrighted work is introduced into a computer, even if the only utilization later made of it falls squarely within one of the exemptions. So, the Revision Bill, having ceremoniously conferred the alleged exemptions with one hand, brusquely takes them back with the other; indeed, it takes them before they are really given. The performances and displays of copyrighted works as described in the exemptions are not free as far as computer operations are concerned—not truly exempted—when payment can be exacted at the threshold or access to the copyrighted works can be denied altogether by the copyright proprietors.

With respect to input, the Bill is harsher toward computers used for education than toward educational broadcasting. In the case of educational broadcasting, an additional exemption allows "ephemeral recordings" of "transmission programs" that embody the performances and displays of copyrighted works.

It has been suggested that the copyright proprietor must be able to control the introduction of the work into the computer because the computer has great flexibility. While the work is "in" the computer, there is no assurance of its being availed of only in the exempted ways. But it is surely a novel prescription to the blocking of access in order to prevent possible future theft. More-

over, the protection is illusory. Anyone who intends to infringe a work without payment would not hesitate to make the input without notice or payment to the proprietor. We should add that the computer can be set up to keep records, for billing purposes, of its manipulation of a copyrighted work.

Our objection to making input an infringement without regard to the nature of subsequent uses does not mean that we would oppose a blanket licensing of works for all-purpose computer utilizations. Where any non-exempt utilization of the work is contemplated, the practice may well become the regular mode.

It has also been argued that a copyright owner is entitled to the exclusive right to translate his work into machine-readable form. If, indeed, he has prepared it in a form suitable for use directly by the computer, the chances are very good that an institution will buy that

## Input Could Be An Infringement

product rather than go to the expense of putting the material in the necessary form. But there will be cases where the proprietor is not interested in making the transformation, and institutions must have access to the work in order to take the benefit of the exemption.

Of course, any exemption of the input *as such* should be lost if the work is thereafter used, without consent, in excess of the applicable statutory exemptions on use. So, in revising the current bill, technical advice might be sought on the feasibility of prescribing that after a work is inputted and used for exempt purposes, it must be removed from the machine.

At some stage, it may become possible technically to require that inputs, even if themselves exempt, shall be reported to an official register. The important point is that input should not constitute an infringement when the uses made are exempt; otherwise the so-called exemptions are completely aborted.

WE HAVE SHOWN THE SERIOUS INADEQUACIES OF THE exemptions related to computer operations. Understandably concerned about the potentialities of such uses of copyrighted works, the draftsmen of the Revision Bill have, in effect, gone to the extreme of shutting off nearly all substantial preferences for educational, research, and library purposes.

A more equitable line must be found. Consideration probably should start by seeing how far it is fair and feasible to hold to the general line of exempting performances or displays of works for teaching, research, or



library purposes in face-to-face situations and in closed transmissions controlled by nonprofit educational and similar organizations.

The line of exemption should not be twisted by harassing or frustrating limitations, such as an insistence that to retain exemption transmissions must be activated by the transmitting organization rather than the recipients.

In all events, the remedy of injunction should not be available against educational or like users. In disputes over terms as to a nonexempt use, a reasonable rate should be paid, as determined as a last resort by a court, taking into account, among other relevant factors, the nature of the using institution. Such a provision will serve, collaterally, the benevolent purpose of encouraging the creation of satisfactory clearing house arrangements for licensing copyrighted works.

In recognition of the fact that the entire situation is fluid, and that lines drawn in the statute may turn out to be too favorable to education and similar interests or not favorable enough, the new law should contain internal machinery for correction. To that vital subject we now turn.

The House report candidly admits that "the problem of computer uses of copyrighted material" was "touched on rather lightly at the hearings." Nevertheless the Subcommittee, later the full Committee, and then the full House went on to lay down comprehensive restrictions on computer uses, and all this without creating internal statutory machinery for correction later. With deference, we say that this was a mistake.

The House Report goes no further than to recognize that the absence of any clearance systems outside the music field is serious. As to that, it makes only a weak proposal that the interested parties should try to reach some accommodations *after* the Bill is enacted. Even here it does not draw the obvious inference: provision against injunctive relief is indispensable as long as a viable clearance system does not exist. It must be con-

ceded that the computer field is subject to rapid change, that regulations now adopted may, and indeed very likely will, prove later to be foolish. The entire environment is changing.

It is hazardous to rely on the usual process of formal legislative amendment to correct abuses as they arise. Experience with a number of provisions in the present Copyright Act has definitely shown that such reliance is illusory. In the copyright field, abuses are advantages seen from the other side; they are fiercely defended by the favored groups and become extremely hard to dislodge.

Some procedure should be found to supply the element of self-correction; otherwise the Revision Bill will be obsolete on the day it is enacted. Any one of a number of devices could be adopted. One could consist of the establishment under the law of an administrative body with appropriate delegated power. It could consist of a body authorized to amend or add to the legislation, subject to Congressional veto. Or, it could consist of an advisory council directed to keep the subject under consideration, study the problems as they come up, and report to a Joint Congressional Committee, with the Committee then making proposals for consideration by Congress.

One or another of the described devices may be useful for purposes beyond that of accommodating the law to the changing panorama of the computer. For example, the Revision Bill relegates the problem of photocopying to the general language of the section on "fair use."

Greater clarity should be sought. Thus it may be well to provide for the possibility of laying down from time to time, on the basis of experience, definite rules-of-thumb for photocopying.

Whatever may be the need in that quarter, an adjunct to the statute is clearly and urgently needed for the solution over a period of time of the copyright questions generated by the computer.

## Oettinger: Danger to Teaching CONTINUED

tant or a secretary. The foregoing was all stated in the first person and with very specific reference to my own interests. Nevertheless I am familiar enough with the work of my colleagues in computing, libraries, and information retrieval to believe that I could quite safely have said "we," substituted innumerable variations on the general theme of educational technology or switched altogether to the broader problem of library modernization. What I have said would still remain true. Beyond

my immediate personal concerns, I can see other curious and perhaps earlier unforeseen consequences of the limitations of Section 110 (2). One could argue, for example, that programmed instruction of the linear kind where each student is presented with precisely the same sequence of questions as every other, could legitimately take place if time and content of transmissions were controlled by the transmitting organization. However, the use of branching instructional programs where the



future course of instruction, the nature of questions and so on depends on prior responses by the student might well constitute "a choice by individual recipients in activating transmission" and therefore an infringement!

There is still considerable controversy among investigators of these modes of programmed instruction as to which is more effective and in what circumstances. It would be a rather curious precedent in our society and I need hardly say an unfortunate one, to have scientific questions decided *a priori* by legislation.

A look slightly ahead of us may further help in seeing the relevant provisions of the Bill in some perspective. There now exist machines that can scan printed material of limited type fonts, and convert it into machine readable form. There also exist experimental means for taking words stored in a computer and converting these into the sounds that would be heard if a person were to pronounce the words. If such processes were perfected and extended even in a limited form, one could visualize a prosthetic device which would enable a blind man to turn any book into a talking book without the delays and difficulties attendant on conversion into Braille or on recording by a volunteer reader.

We would then face the anomaly that a normal man who has purchased a book in a bookstore or borrowed it from a library would be within his full rights in reading this book anytime and anywhere he pleased; but, if I read the provisions of the Bill correctly, that a blind man using his prosthetic machine might well be infringing a copyright:

(a) by causing his prosthetic machine to translate print into machine-readable form, whether or not transmission to a remote computer is required. If transmission were necessary, as is much more likely initially, then there might be further infringement;

(b) by his exceeding the capricious 100-mile limit (Section 100 (2)B), which would be probable since the necessary computers most likely could be provided economically only at a limited number of regional centers; [or]

(c) through his exercising his choice as an individual recipient "in activating transmission from an information storage and retrieval system" or, as the Bill goes on, "any similar device, machine, or process."

The problems which my colleagues and I are trying to solve range in interest and applicability from the purest of theoretical investigations to the most immediately applicable design and engineering work.

In a sense, however, we are the victims of our own rosy predictions. The proposed Bill drastically limits traditional exemptions, although there is no clear and present danger of infringements.



# EDUCOM

Bulletin of the Interuniversity Communications Council (EDUCOM)



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*H. Blackstone*

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# *The Computer and the Law*

The computer is adding a new dimension to old social problems. There is a growing interest in large computerized information centers including the one proposed for the federal government and the national information network (EDUNET) planned by EDUCOM. The threats to human rights which have, in some cases, existed for decades, will be aggravated by such widespread facilities for information storage and retrieval. Added vigilance is required to assure that the computer does not lead us into 1984. EDUCOM, for example, has established a task force on legal and related matters which is concerned with both the rights and duties of those scholars who are working with the new communications media. On the other hand, the computer may simplify both the teaching and practice of law. We are attempting in this article to point out some of the special problems which are created or worsened by the computer as well as some of the opportunities it presents in legal teaching and research.



# *Invasion of Privacy*

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It has been proposed that the federal government should merge all of its computer operations and create one mammoth Federal Data Center which would be available to industry and researchers as well as for government use. There are more than twenty federal agencies that have data about individuals in the United States. In terms of cost and efficiency, the establishment of a Data Center would seem to be eminently reasonable.

Similar data centers have been proposed on state and local levels, as well as others for medical records of patients, for the academic records of students, and for computerizing credit information. The smaller data centers, too, offer many advantages for public record keeping, patient care, and ease of transfer of students from one institution to another. But the advantages must be weighed against the dangers inherent in such centers. It has been suggested, for example, that credit information and medical records—physical and psychiatric—should never be included in any information network.

As might be supposed, the major discussions of threats to privacy have been in relation to the proposed Federal Data Center. Such a center would bring together all of the information reported to federal agencies. All of that material would be potentially available to anyone who rightfully had access to any part of it. The scope of information is frightening when one considers the records in even a few of the agencies involved: the Internal Revenue Service; the Bureau of the Census; the Immigration and Naturalization Service; the Social Security Administration; the files of the F.B.I.; the Civil Service records of federal employees; and, possibly, medical records of people treated in government hospitals.

The Subcommittee on Administrative Practice and Procedure of the Senate Judiciary Committee and a subcommittee of the House Committee on Government Operations have both held hearings on this issue. Opposition to the establishment of a Federal Data Center stresses its threat to the individual's right to privacy. Information which is outdated, incomplete, or inaccurate can cause grave injustice to a citizen. He can be damaged by data in the bank which he is not even aware are recorded there. In that situation, his right to face his accuser is infringed also.

Those witnesses who admit the advantages of such a center urge careful study of ways to provide a fail-safe system to protect the information in the bank. Others question the ability of a government agency such as the Internal Revenue Service to guarantee the confidential status of information provided them when the information is part of a general center. The Center's proponents have suggested, for example, that a special security code number be assigned to the data on each individual so that no one can be identified without that code. It was also suggested that the computer be programmed to provide only those kinds of information which the inquirer is authorized to obtain.

In his testimony before the Senate subcommittee last March, Arthur R. Miller, Professor of Law, University of Michigan, and co-chairman of the EDUCOM Task Force on Legal and Related Matters, recommended "direct federal intercession to insure that the Data Center functions in a manner consistent with the right of individual privacy . . ." He said that Congressional action is necessary to establish a proper balance between the needs of the national government for data and the right of individual privacy. The legislation must be reinforced by statutory civil remedies and penal sanctions expanding the existing tort concepts. He recommended the





establishment of a completely independent agency to administer the center.

It is not only on the federal level, however, that the right to privacy must be protected. Wherever masses of information about citizens are being collected in one place, mechanisms must be found to assure the accuracy and currency of the entries, to prevent the easy identification of individuals and to bar unauthorized persons from getting the information.

## *Censorship*

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The growing interest in large computer networks raises serious problems of curtailment of freedom of speech. Obviously, the capacity of even the largest computer is limited. Yet, does the refusal to include or reference the work of a scholar in, for example, a national educational network limit his right to "publish"? What fair criteria for inclusion or exclusion can be established? If only part of a work is included, is the excluded part "censored"? EDUNET will be faced with problems of these kinds almost as soon as it becomes operational.

If a communications medium such as EDUNET is established, the problem becomes more acute. An EDUNET would be a substitute for other media. This would result then in a single channel dissemination system in which even subtler forms of censorship could be exercised. For example, a work could be referenced in the index, but in such an unorthodox way that it would seldom be called forth. Or, if a request produced only a set number of articles, the one which was "censored" could be programmed to be called up only on a second request.

A computer network must, of course, set priority for accessing. And priority setting is also a kind of censorship. If a scholar must queue up to ask his question of the net, his work may be delayed in a way that, to him at least, is damaging. What limitations of freedom are inherent here? What criteria must be set? By whom? What appeal is available? These questions, also, must be answered with the development of an EDUNET.



## *Monopoly*

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The monopolistic implications of attempts to effect compatibility of computer hardware and systems concern many informed people. Burgeoning networks could influence institutions that are potential terminals to select hardware compatible with that already in the net. Ultimately, one company could develop a monopoly on the production of equipment, becoming a public utility with attendant government control of rates of computer communications networks.

On the other hand, many computer experts maintain that common hardware is unnecessary in a network. Interfaces can be developed so that otherwise incompatible terminals will be able to communicate. Through message-switching and on-line directory



capabilities, requests for services can be matched against installations capable of providing the services and each request will automatically be routed to the proper installation. If networks were routinely designed so that hardware compatibility is not essential, the threat of monopoly would be reduced. An EDUNET could become a monopoly itself, a sole controller of information if not of hardware. Under such circumstances, what steps should be taken to guarantee complete access to information available in the net?

## Copyright

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The ownership of software through copyright is also an issue being hotly debated. The issue was raised when the Congress began hearings on a new copyright bill in which it was proposed that computer programs be eligible for copyright. The problem was discussed at length in the *Bulletin*, April 1967. A bill has been introduced in the Senate to establish a study committee to investigate the whole problem of the computer in relation to copyright.

## The Computer and the Administration of Justice

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Computer print-outs have already been accepted as evidence in litigation.<sup>1</sup> It has been suggested, however, that the attorney who is preparing a case involving print-outs will have to devote much time and effort in making it clear that the material he presents is not subject to hearsay and other technical objections,

<sup>1</sup> *Law and Computers in the Mid-Sixties*. Philadelphia: Joint Committee on Continuing Legal Education of the American Law Institute and the American Bar Association, 1966, p. 53.

He must describe how the program works and demonstrate that the computing process does not—even cannot—distort the presumably authentic data on which it operates.

Tort liability may be involved in numerous ways. For example, the attorney will be concerned with advising his client on the use of the computer—so that the client is neither too soon nor too late in the purchase and use of electronic data processing equipment. The client, for example, may be in the position of the airline that used radar before it was perfected; the pilot relied on an imperfect mechanism and crashed into a mountain because he had misplaced confidence in the mechanism. Or the client may be in the position of the airline that did not use radar; the pilot crashed into the mountain; and, if radar had been used, it was probable that the crash would have been averted.

New problems for insurance, not only on equipment, but also liability coverage, are created by the computer. If, for example, an insurance company is billing its customers entirely by computer through a service agency and neglects to mail a notice of a premium that is due, who is at fault if the insurance lapses?

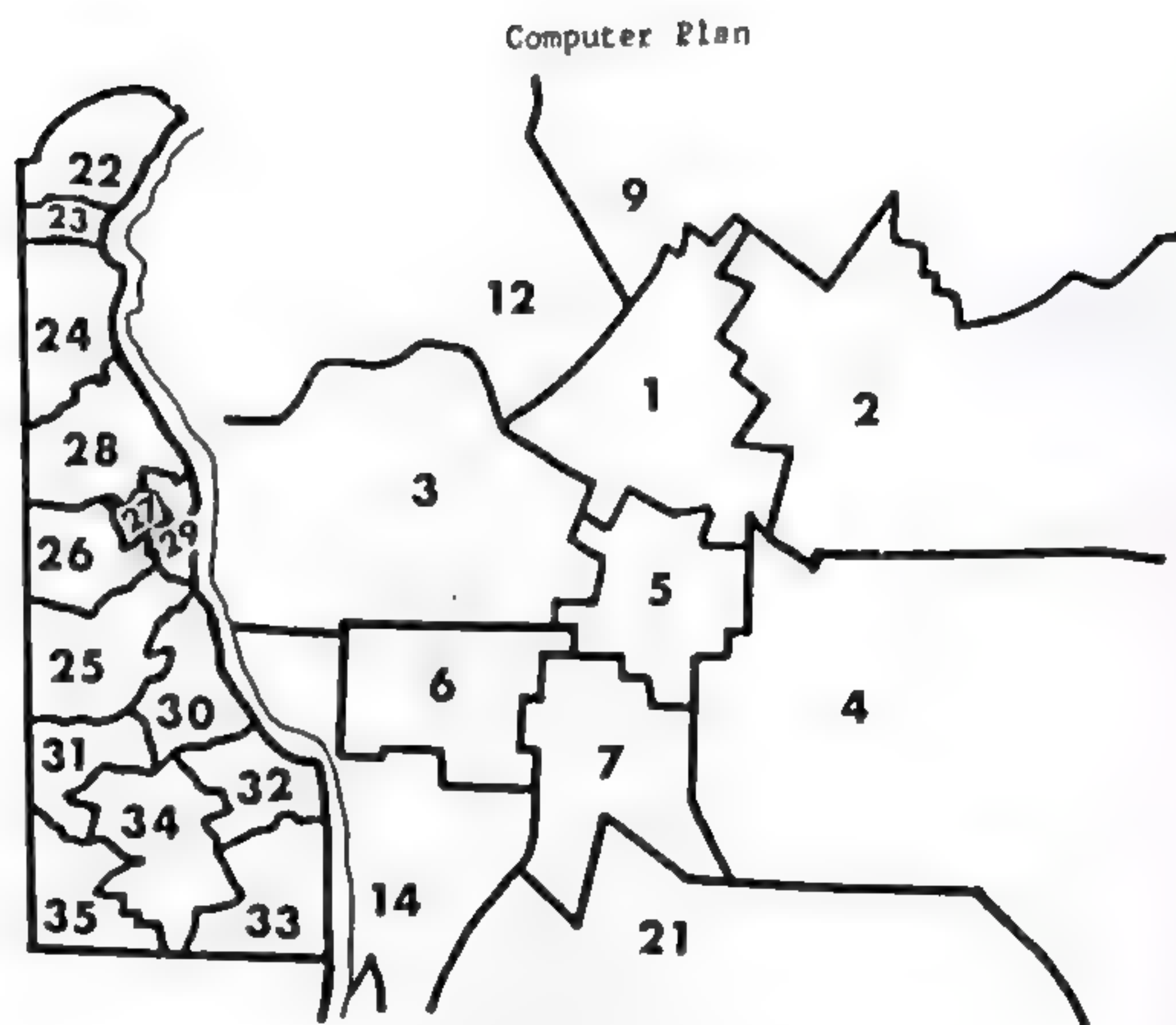
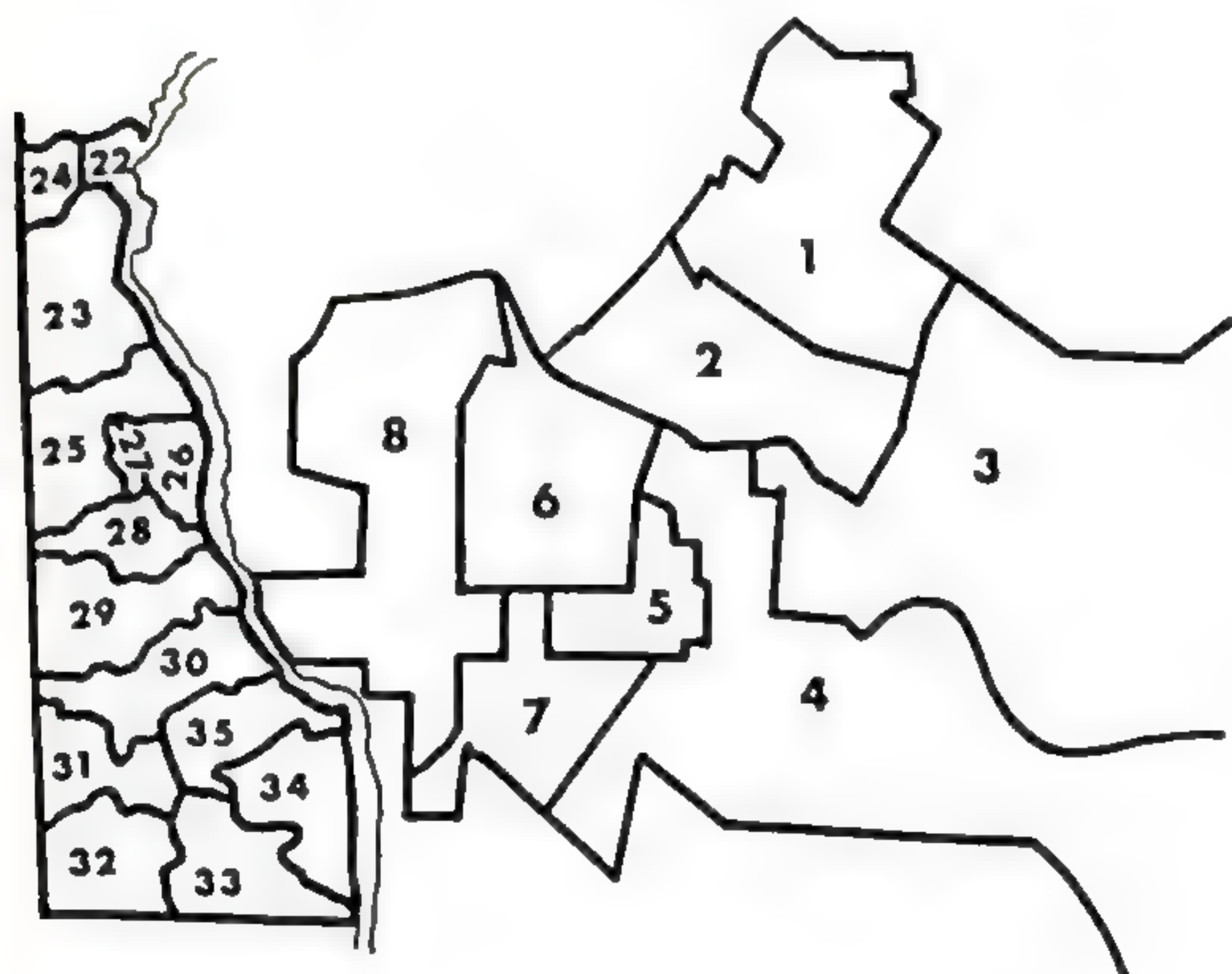
Indeed, the problem of liability for the negligent operation of a computer system is one which an EDUNET also faces. The problems involved include the mangling of data given the computer to store; the manipulation of a bad data base with, of course, bad data resulting; or the scrambling of the data through malfunctioning of the circuitry.

It has also been suggested that a data base containing experience in sentencing of criminals would be valuable to judges. If such data were used, sentencing could be consistent throughout the nation.

Law enforcement nets—ultimately perhaps even on a worldwide scale—present additional problems for securing human rights on the one hand and also better means of protecting society from criminals on the other. Here again the problem of what computer entries mean could be of primary importance. In his testimony before the Senate subcommittee, Arthur Miller warned, "The question of context is most graphically presented in terms of one of the most dangerous types of information—the unexplained and incomplete arrest record. Is it likely that a citizen whose file contains an entry 'arrested, 6/1/42; convicted felony, 1/6/43; 3 years, Leavenworth' will be given federal employment or be accorded the governmental courtesies given other citizens? Yet our subject may simply have been a conscientious objector."



Exhibit 20  
Comparison of Representative Districts, Wilmington  
1964 Statute



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The American Law Institute."

## *The Computer in Politics*

Nonpartisan groups in several states have used computers to produce plans for the new legislative districts required by the Supreme Court's "one man—one vote" ruling. None has been accepted for use, however. Ultimately, the speed of the computer in such tedious processes as totalling of population, along with its capacity to simulate other characteristics of the districts produced, will probably result in its use. That is especially likely because the districts must be revised in relation to population changes shown in each decennial census.

Computer redistricting may have been unsuccessful because of what has been called the computer's political impartiality. Actually, whether the districts produced do reflect the interests of the political party in power could be determined by the politics of the programmer.

Your Institutional Representative to EDUCOM has copies of the minutes of all of the meetings of the Board of Trustees and of the Council. He will be happy to have you read them.

## *The Computer As a Research Tool*

But what can the computer do to simplify the work of the attorney and, closely related to it, the work of the legislator? Some early research to develop the computer as an aid to legal research was begun in 1959 by the Health Law Center and the Computing Center at the University of Pittsburgh. The first public demonstration of legal information retrieval was a demonstration of the Centers' system for searching statutes by computer at the American Bar Association's annual meeting in August 1960. In addition to the statutes of seven states, the Health Law Center has computerized all of the Pennsylvania Supreme and Superior Courts' cases; all of those of the Court of Appeals for the Third Circuit since 1950; and all of those of the United States Supreme Court since 1950.

The Center's system stores full text, which is searched for significant words or phrases. For searching purposes, however, the computer ignores such frequently occurring words as and, if, but, thereby reducing the number of words to be searched by more than 40 percent.

Commercial legal information retrieval firms have







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been in operation since 1964. One of them has stored federal and state statutes and case law on the computer. It does not store full text, however, but rather citations indexed in a thesaurus of descriptors. Queries are generated at remote points via Western Union Telex and replies are returned the same way.

The ready access to statute law afforded by the computer has many advantages to the legislator as well as to the attorney. An example cited by Thomas M. Cooley II in the March 1967 issue of the *Pennsylvania Bar Association Quarterly*<sup>1</sup> is the problem facing a legislator or staff member who is starting to work on drafting or revising legislation. He must assure himself that he has before him all of the existing statutory provisions relating to the subject. When the area under consideration is broad and ill-defined, manual searching can be onerous. On the other hand, the computer can read all of the Pennsylvania statutes, for example, and report on a desired subject in less than one hour.

*"From a KWIC (key word in context) printout on the Kansas Statutes as run by the Health Law Center, University of Pittsburgh."*

## *International Aspects*

In West Germany, experiments are underway in formulating statutes on the computer, using game theory. The formulation is based on all the social and economic facts related to the subject of the statute. This is probably the most advanced use of computers in the law to date.

The International Secretariat of the World Peace Through Law Center announced, in January 1966, that it will serve as a worldwide coordinator of programs and progress in the automation of international law. The new service is a significant development in

<sup>1</sup> Cooley, Thomas M. II, "The Computer—An Indispensable Aid to Statutory Revision and Drafting," *Pennsylvania Bar Association Quarterly*, March 1967, p. 315 ff.





the activities of the Center to build law rules and legal institutions for world peace. In a conference in Geneva in July, the Center demonstrated legal information retrieval from New York and several European countries. A legal network international in character would result in the need for multi-national treaties for the transmission of information across national borders. There is a very strong analogy to the Early Bird satellite and television. The idea has exciting possibilities. But it will make all of the legal implications more acute because of the completely different social philosophies which must be considered in the establishment of such a net.

## *The Computer and Legal Education*

The computer will influence the substance of the law profoundly and it will influence the practice of law as well. The Joint Committee on Continuing Education of the American Law Institute and the American Bar Association sponsored its first Course of Study on Law and Computers in 1962. Since that time, the Joint Committee has conducted similar courses in various parts of the country, sometimes in cooperation with ABA Special Committee on Electronic Data Retrieval. The Committee has also published an overview which it describes as "An Introductory Handbook," titled *Computers and the Law*. Last year, the American Association of Law Libraries and the School of Law, University of California at Davis sponsored the California Institute on Computer Science for Law Librarians.

In spite of the efforts to keep the practicing attorney abreast of newer developments, the law in general has been late in coming to the newer technologies. There is currently, however, a new upsurge of interest. The American Association of Law Schools has a committee investigating computer-assisted instruction in law schools. The School of Law at the University of Michigan is one of the institutions currently experimenting with CAI. There is no doubt that the attorney who can use the computer himself will find it a more valuable tool and will comprehend the legal ramifications of its use far better than the attorney who must work through a computer specialist.



A well-rounded legal curriculum should include effective courses on the computer, oriented towards theory and application to the law. Broader educational opportunities must be provided to enable professors of law to cope more effectively with the intrusion of the computer into legal activity.

It is apparent that the computer has brought additional problems to modern society. It is equally apparent that there are no easy solutions. Yet, solutions must be found so that the potential of the computer for the advancement of mankind can be realized. Any other course would be unthinkable.



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# News & Notes

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## PROJECT ARISTOTLE

The objective of Project ARISTOTLE, which was established in 1966, is to encourage continuing communication among government, industry, and education in order to contribute to the quality of the nation's education and training. Task groups made up of volunteers from industry, government, national associations, and academic groups do the work of the organization. They are responsible for translating general policies into specific objectives. The chairmen of the task groups form the Steering Committee which provides the overall coordination of the project, and plans and organizes the annual symposium which is fundamental to the concept of the project. The symposium this year has been scheduled for December 6 and 7 in the Washington Hilton, Washington, D.C. There will be at least twenty separate panels. Vice President Hubert Humphrey will give the keynote address. Senator Wayne Morse, Representative Edith Greene, and Secretary John Gardner of HEW are also expected to participate.

Task groups have been established in ten areas: 1) Project 100,000 training; 2) media; 3) information storage, retrieval, and dissemination; 4) educational research; 5) new developments; 6) systems approach to education; 7) standards, measurement, and evaluation; 8) courses, tasks, and skills; 9) government and industry interface; 10) international considerations. The task groups and the Steering Committee have the responsibility to provide reasonable coordination and eliminate any unnecessary overlap.

Since the aims of Project ARISTOTLE and the interests of EDUCOM are so similar, the two organizations are moving toward closer cooperation. A member of the EDUCOM staff meets regularly with the ARISTOTLE Steering Committee; the EDUCOM *Bulletin* is distributed to each of the ARISTOTLE task force chairmen; and Mr. Marvin Kahn of the Project will discuss its work at the meeting of the EDUCOM Council to be held October 31 and November 1 in Pittsburgh.

The initial ARISTOTLE planning was done largely by member organizations of the National Security Industrial Association (NSIA). NSIA was founded over twenty years ago, largely through the efforts of Defense Secretary James Forrestal. Its members participate on a voluntary, objective, and cooperative basis in promoting better understanding between industry and government; in assisting government in

those areas where industrial experience and know-how are applicable; and in providing for improved communications within industry and between industry and government. Membership in NSIA is not, however, a requisite for participation in ARISTOTLE. Although the initial impetus for this project has been supplied by the Department of Defense, the U.S. Office of Education is intimately involved in its work.

## CONFERENCES

### Practical Applications of Computer Systems

The National Center of Communication Arts and Sciences, the Federation of Rocky Mountain States, Inc., and System Development Corporation will sponsor a conference on practical applications of computer systems at the Broadmoor Hotel, Colorado Springs, October 30, 31, and November 1, 1967. The conference will cover the use of computers in the areas of education, law enforcement, judicial processes, business management, health services, urban and regional planning, and publication and library services.

Special sessions will be held concerning each of these areas of interest, and case histories and demonstrations will be presented. General sessions will cover the needs, capabilities, and trends in computing technology, and the practical implication of computer systems.

For further information write Dr. Thorrel B. Fest, P.O. Box 207, Denver, Colorado 80202.

### Content Analysis

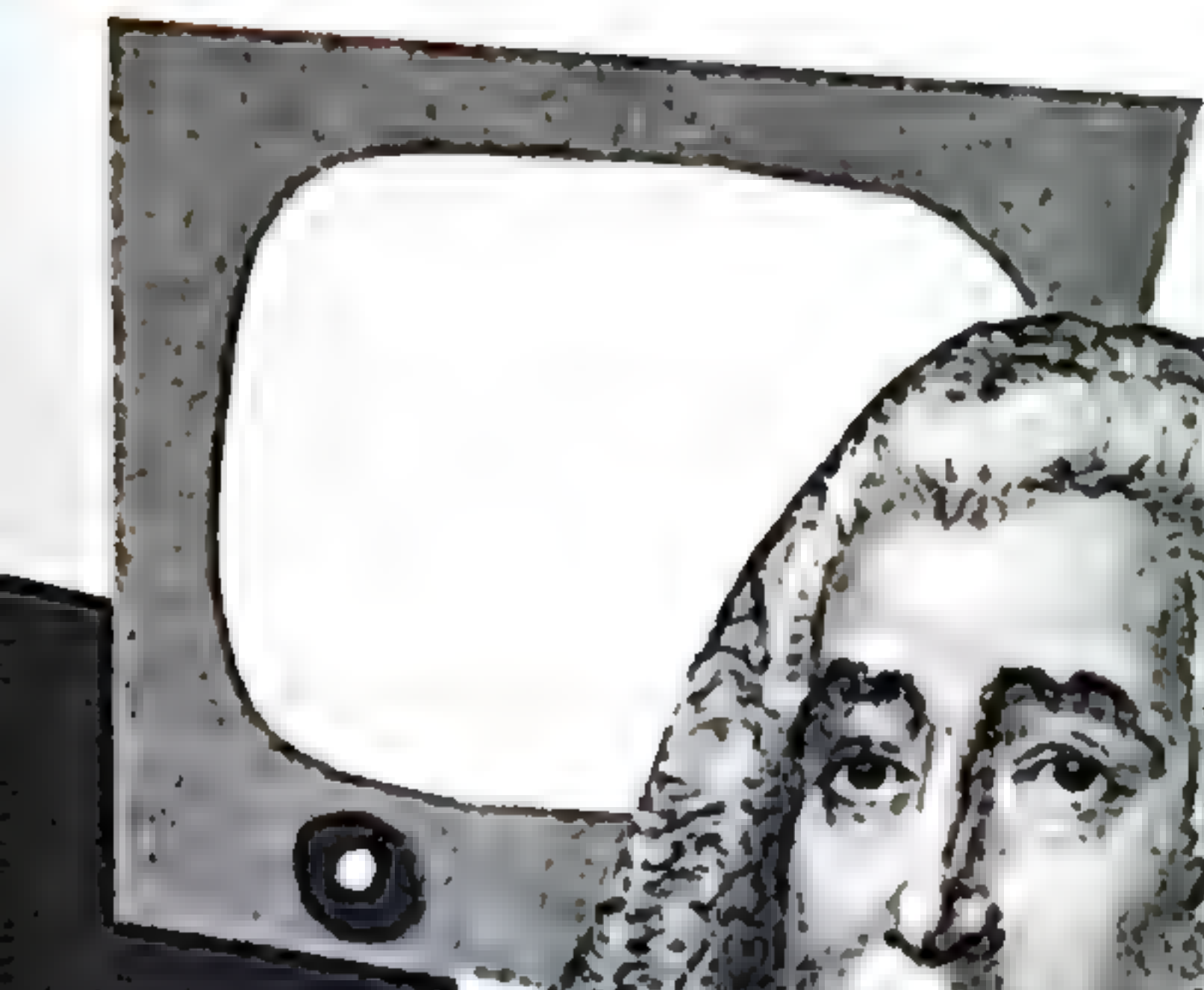
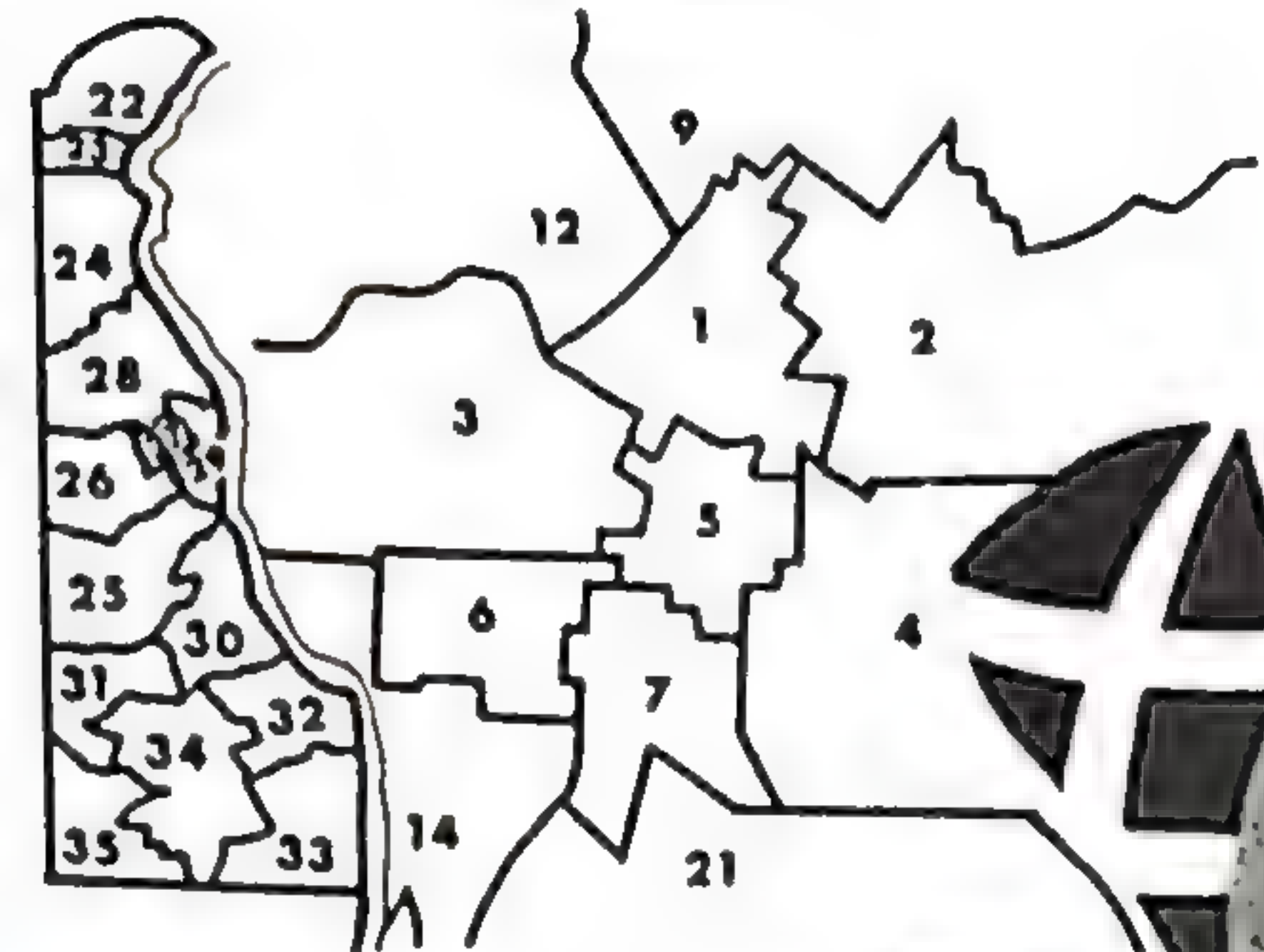
A national conference on Content Analysis is being planned for November 17-19, 1967 at the University of Pennsylvania. Well-known researchers in various fields are preparing some two dozen specially commissioned papers in such general areas as "Theory and Definition," "Recording and Notation," "Inference," and "Computer Techniques and Computational Linguistics." Meetings will be open to the public. For further information write Dean George Gerbner, Annenberg School of Communications, University of Pennsylvania, Philadelphia, Pennsylvania 19104.

### Emerging Concepts in Computer Graphics

A conference, EMERGING CONCEPTS IN COMPUTER GRAPHICS, will be held at the University of Illinois November 5, 6, 7, and 8, 1967. The conference will be directed towards those who have some knowledge of computer graphics. Attendance will be limited to permit meaningful discussions. For information write Professor C. W. Gear, Department of Computer Science, University of Illinois, Urbana, Illinois 61801.



Computer Plan



*H. J. Black*

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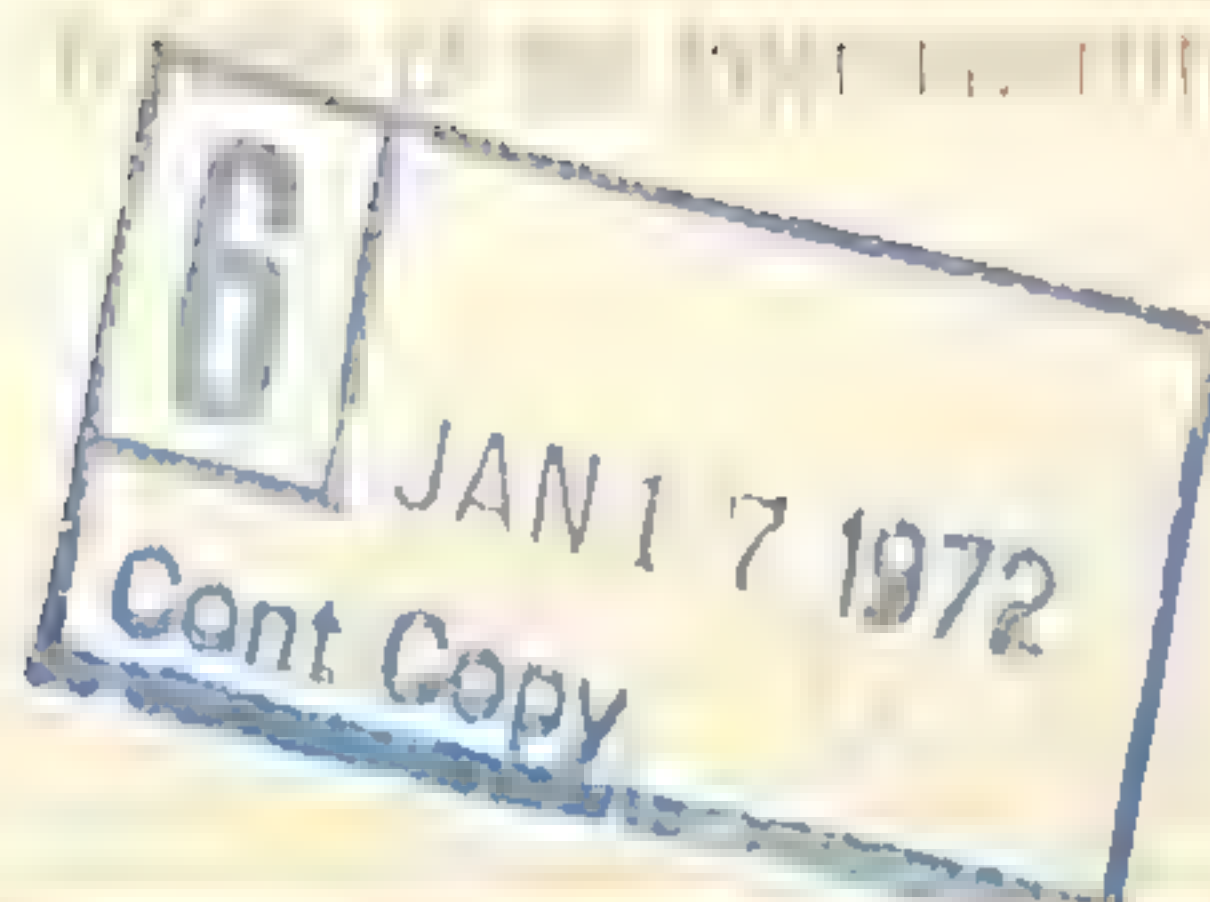




VOLUME 3, NUMBER 3

# EDUCOM

THE JOURNAL OF THE EDUCATIONAL TECHNOLOGY SOCIETY OF THE UNITED STATES OF AMERICA



NORTHWESTERN UNIVERSITY'S CHICAGO CAMPUS



# EDUCOM BULLETIN

Vol. 3, No. 3

May 1968

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Art: JUDY McFARLAND

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*Cover photo courtesy Northwestern University*

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# TECHNICAL SESSIONS: NEW FEATURE AT COUNCIL MEETING

**I**N ORDER to keep institutional representatives as well as faculty members current with the state-of-the-art in the areas under study by the EDUCOM panels, this year's business meeting in Chicago will be followed by a day and a half of technical sessions. The business meeting, for institutional representatives only, will be held on the morning of 14 May in Thorne Hall on Northwestern University's Chicago campus. The afternoon, and the morning of the following day, will be devoted to three separate sessions on the application to education of: Video and Films; Interconnected Computers; and Micrographics. The sessions will be in the form of panels with a moderator and three or more speakers from universities and industry. At the

final session, the moderators will sum up the reactions and the recommendations of the participants.

Members will be free to attend whichever panel best covers their area of interest. In addition, institutional representatives may bring guests to these sessions for a minimal registration fee. It is hoped that interested persons from the various sectors of the academic community will attend and benefit. Opinion will be solicited as to the effectiveness of this experiment, and the Board of Trustees will take action to shape this form of interaction to the needs of the EDUCOM community.

The planned program for the Council Meeting and the Technical Sessions follows:

## COUNCIL PROGRAM

Monday, May 13, 1968

2:00 p.m. Dedication of Evanston Campus  
Computer Facility

Tuesday, May 14

8:30- 9:30 Registration; selection of Thorne Hall  
Technical Session

9:30-12:00 Business Session: Opening Thorne Hall  
address by Dr. John A.  
Cooper, Dean of Sciences,  
Northwestern University

12:00- 1:30 Lunch (on campus)

1:30- 4:30 Technical Sessions: Papers Wieboldt Hall  
and intrapanel discussion

Wednesday, May 15

9:00-12:00 Technical Sessions: panel Wieboldt Hall  
and audience discussion;  
recommendations for  
EDUCOM activities

12:00- 1:30 Lunch (on campus)

1:30- 3:30 Plenary Session: Summary Thorne Hall  
of panel discussions and  
recommendations

4:00- 6:00 Board of Trustees Meeting

## TECHNICAL SESSIONS

### SESSION I THE APPLICATION TO EDUCATION OF VIDEO AND FILM

Richard Burdick, *Network for Continuing Medical  
Education, N.Y.*

Donald Quayle, *Eastern Educational Network*

Kevin Smith, *Educational Development Center*

\*Tad Mayeda, *EDUCOM*

### SESSION II THE APPLICATION TO EDUCATION OF INTERCONNECTED COMPUTERS

Edward David, *Bell Telephone Laboratories*

Allan B. Ellis, *Harvard University*

Martin Greenberger, *Johns Hopkins University*

Allen Kent, *University of Pittsburgh*

\*Thomas Keenan, *EDUCOM*

### SESSION III THE APPLICATION TO EDUCA- TION OF MICROGRAPHICS

Joseph Becker, *EDUCOM*

Kenneth Janda, *Northwestern University*

Charles Yerkes, *National Cash Register Company*

Carl Nelson, *International Business Machines*

\*Harold King, *EDUCOM*

\* Moderator



# FUNCTIONING MEDIA NETWORKS

EDUCOM's goal of facilitating the extra-organizational communications of the university is expressed through its interest in networks. A long-range objective is the multimedia network EDUNET, but this will be approached by continuation of pertinent research projects and development of plans for smaller networks in various media, each serving an educational need. Many activities, both within and without the university, are planning and testing networks, but there is a limited number which are operating functionally. This group can give both guidance and example to still-developing networks, and, therefore, some of the functioning ones, using different media and in which EDUCOM members participate, are described.

## THE GENESYS TV NETWORK

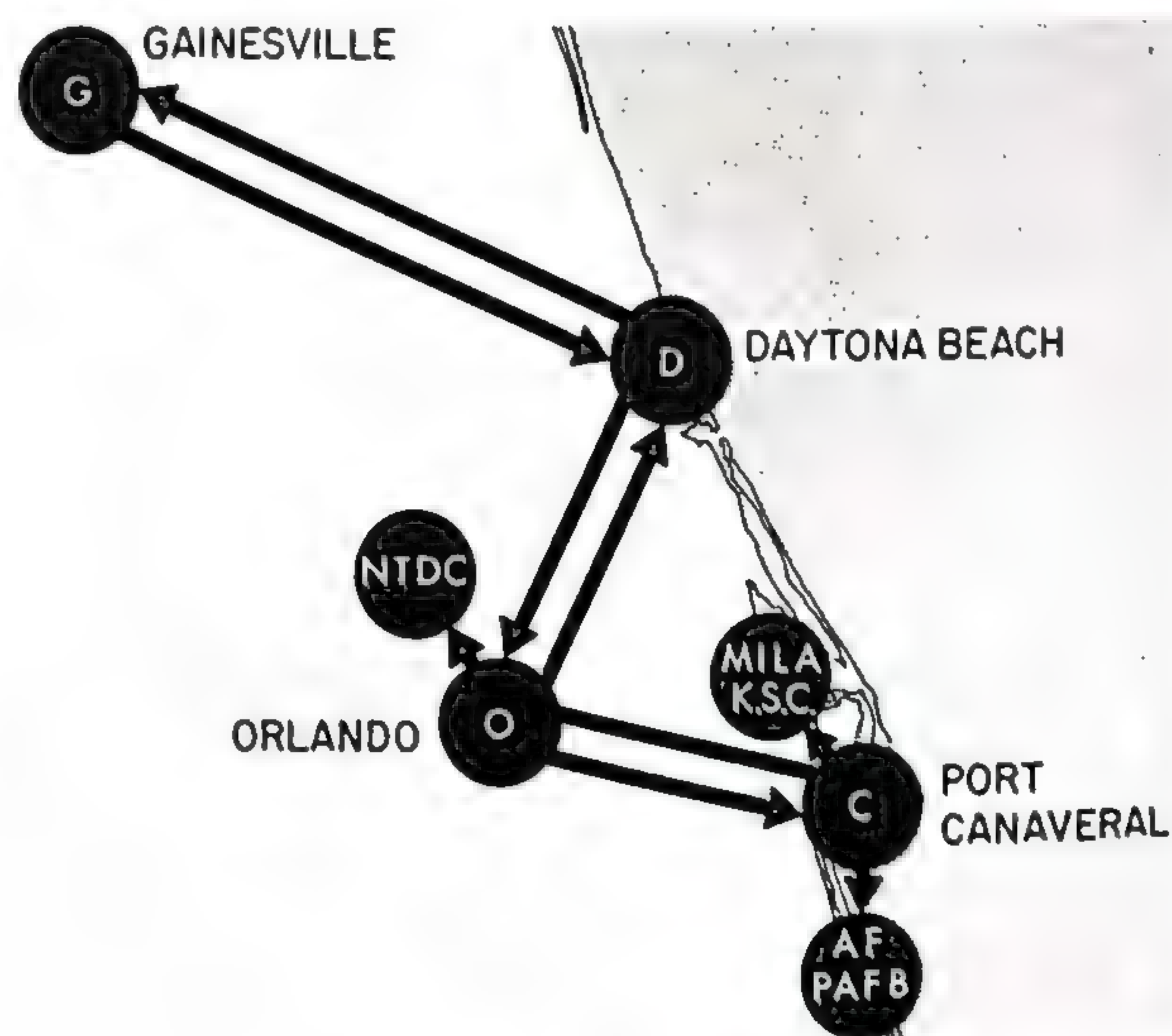
Described as Florida's weapon against technological obsolescence, the Graduate *EN*gineering Education *SY*stem is based on a closed-circuit talk-back television network linking seven operating facilities as an extension of the College of Engineering of the University of Florida.

The network was made possible by a state legislature which faced the shortage of engineering personnel and the ten-year half-life of the graduate engineer, and which authorized funds to build the means for both continuing education and greater advanced-degree opportunities.

Functioning since 1965, GENESYS has its central facility near the Cape Kennedy Space Center. From here it serves remote facilities at Gainesville, Daytona Beach, Orlando and Melbourne. There are branches of the central installation at Patrick Air Force Base and the NASA center, and a branch of the Orlando installation at the Naval Training Device Center there. While much of the instruction is done in the conventional classroom manner by live instructors, all seven terminals are interconnected by closed-circuit,

talk-back TV which can provide specialized courses from any terminal to any of the others. The concept is to offer courses in highly specialized subjects to small numbers of students in a very large geographic area. The plan also will allow individual companies or government agencies to tap the network and set up terminals for employees onsite. Equipment costs are borne by the user, and standard fees are charged the attendees for credit-bearing courses.

The studios at the installations are equipped with two camera chains; one has a vidicon camera head with a 10-1 zoom lens and mounted on a pan-tilt assembly; the other uses a head with interchangeable lenses for picking up flip-cards, slides or other graphic displays. Both are operated from a control room console. In each classroom, or receiving room, there is a 23-inch monitor which can handle six students. Each student has a handset telephone through which he can talk to the instructor and, at the same time, be heard at all of the other stations.

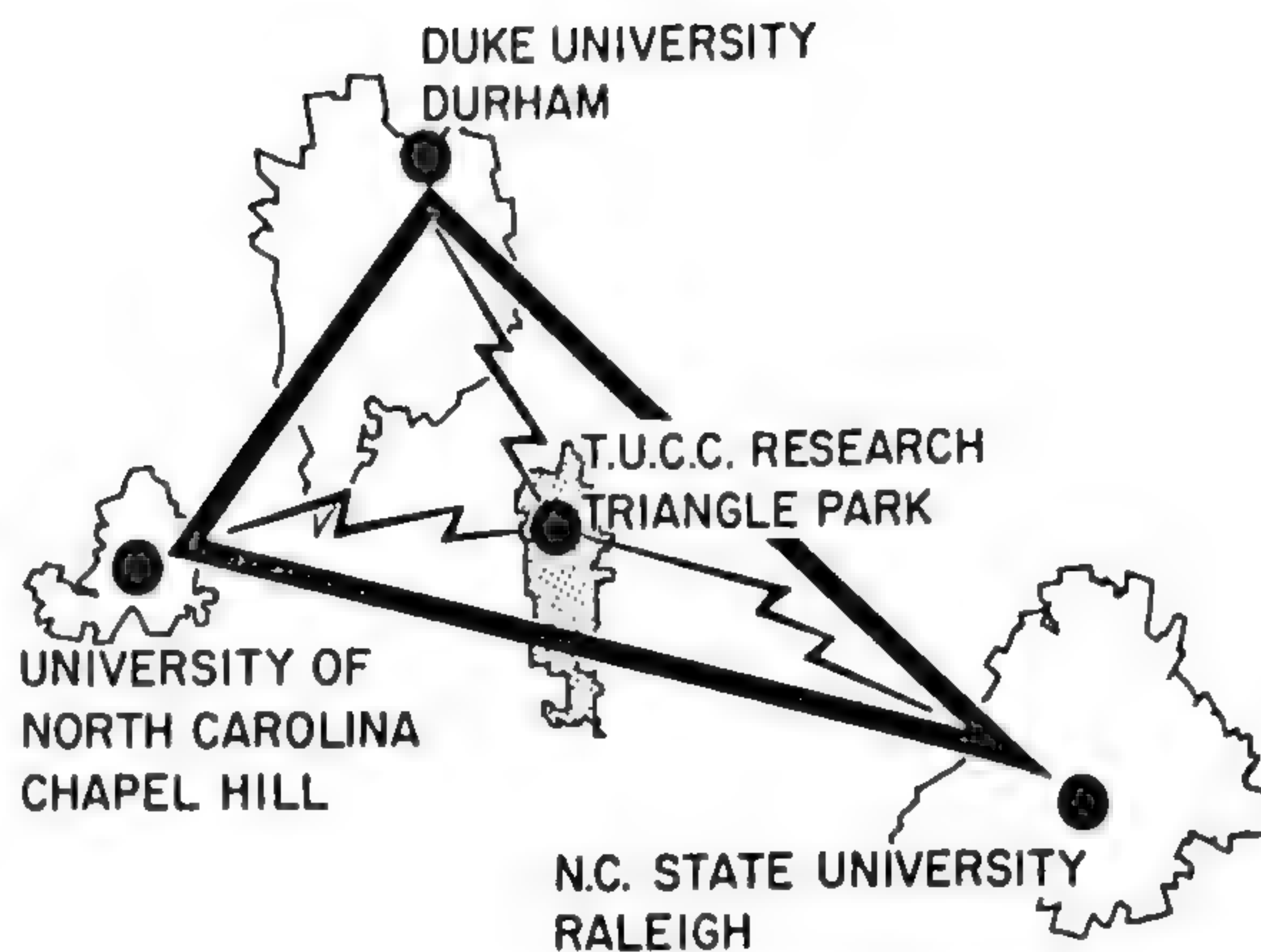


GENESYS TV Network



## TRIANGLE UNIVERSITIES COMPUTER NETWORK

At the heart—or, to put it more accurately, at the mind—of this complex is the TUCC—the Triangle Universities Computation Center, a facility with its own staff and organized as a non-profit corporation with a Board of Directors from its three member institutions. It is located at the center of a geographic triangle with the universities at each point, from ten to 16 miles away. These are: Duke University, a privately financed institution; North Carolina State, a land-grant college; and the University of North Carolina, a state university. They share the costs in order to share their resources through the computer network.



*Triangle Universities Computer Network*

At the TUCC is a System/360 Model 75 computer with a 512K-byte processor memory and a 2-million byte large core storage. It communicates with a different model System/360 on the three campuses, as well as with low and medium speed terminals (teletypes, IBM 1050's, 1978's) in campus buildings and laboratories. At its Computer Center, Duke has a System/360 Model 30 with a 65K-byte processor memory and the necessary disk and tape drives, printers and card punches and readers. North Carolina State has a Model 30 also, and similar peripheral equipment. The University at Chapel Hill has a System/360 Model 40 with a 256K-byte processor memory, and associated equipment. All work is scheduled, transmitted and billed through the campus centers.

The North Carolina network concept has been extended to include other institutions throughout the state. Associated with TUCC is NCCOP—North Carolina Computer Center Orientation Project—which buys remote computer service from the Center and makes it available through dial-up teletype. In addition, the Project furnishes training workshops, specialized teletype software and consulting services. Sixteen colleges were participating last Fall, and more are joining each month.

With its present configuration, the system is handling over 1,000 jobs a day. Continued development of the network has resulted in a throughput several times that of the separate installations and a job cost of less than half as much. Stimulation of research and joint endeavors, multi-terminal operations and the ability to handle massive problems are other accomplishments of the TUCC. According to a recent study by faculty members of the three universities, the stability of the enterprise was due to three decisions:

location of the facility on neutral ground; equal sharing of cost, regardless of use, combined with a scheduling algorithm that equalizes use; and centralization of system service with decentralization of customer consultation and service.

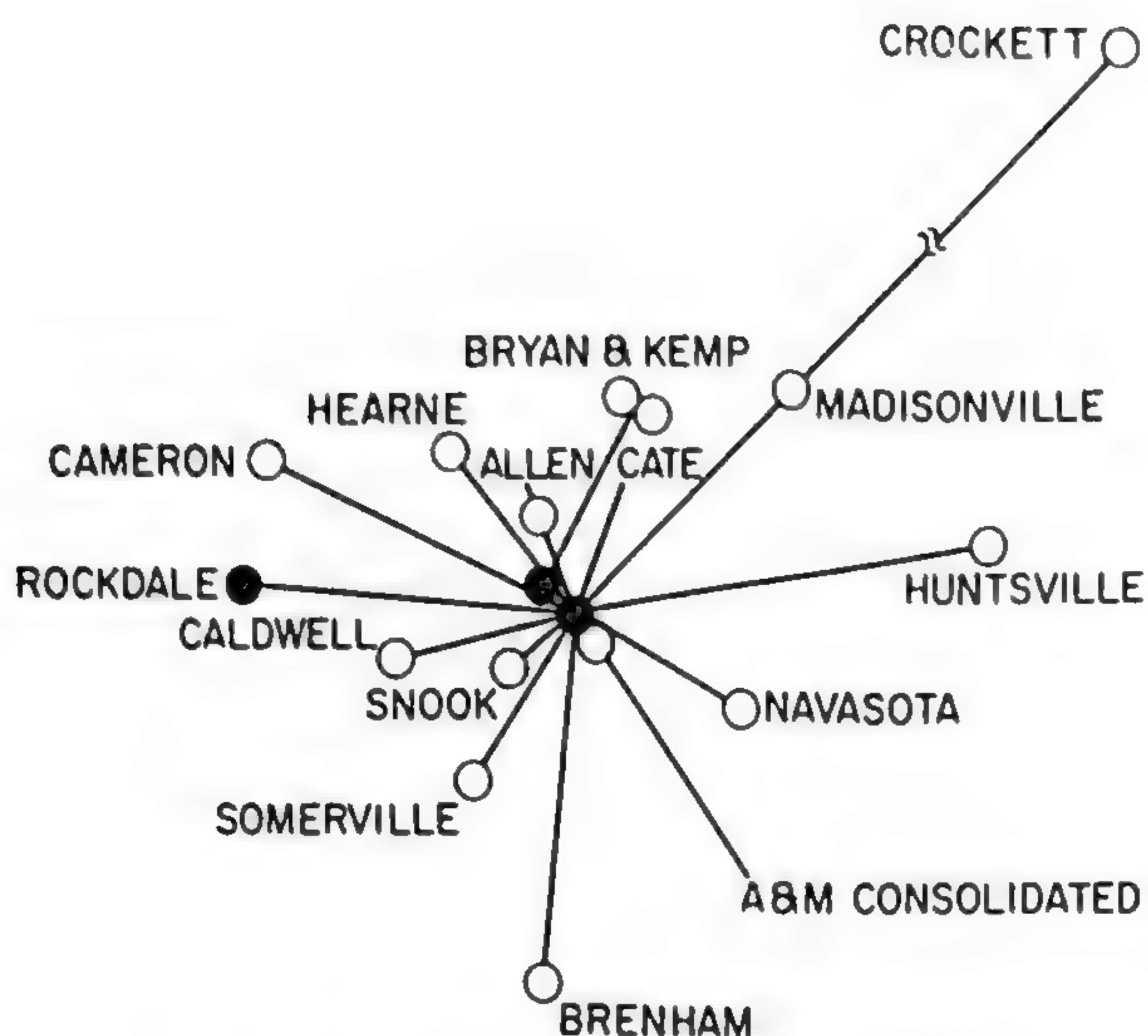
## CATE BLACKBOARD-BY-WIRE NETWORK

In Texas, the CATE Center (Creative Application of Technology to Education) has been working on plans and pilot projects in the area identified by its name. One such project, Blackboard-by-Wire, has been developed into a functional operating network. It serves fifteen schools in the CATE area, which is roughly the triangle demarcated by Houston, Austin and Dallas. The Center is located on the Texas A&M main campus and was originated by the A&M Consolidated Independent School District.

The BBW network is based on the ECS-100 and ECS-150 equipment developed by the Sylvania Electronics Products Division of GT&E. Over pairs of leased telephone wires, the system transmits audio signals and graphic information which is reconstructed on the face of a TV picture tube. The two-way audio permits interaction with the originating teacher during live presentations. The transmission can be taped at the transmitting location, at the receiving location, or at both. Each presentation lasts 30 minutes, allowing for overlap in the classroom schedules among the schools or for supplementation by individual teachers. The courses presently transmitted are in Physics, Mathematics and English Composition. They are at the high school level, but the applicability to higher education is obvious.

In using the graphic portion of the system, the instructor applies a wired, harnessed pen to a special writing surface at a console. The pen senses when it





*CATE Blackboard-by-Wire Network*

is touching the surface and the harness enables measurement of its movements. A drawing is erased when explanation of it is finished; other pictures can be sent by tracing over them on the writing surface; slides can be used from a projector in the individual classroom, operated on cue from the originating teacher.

In the network, there are four transmitting centers. This will permit later subdivision of the system. The receiving stations are equipped with television screens, speakers, and microphones to receive the live transmissions or the recorded ones sent from the transmitting centers. The receiving schools, however, can also record and playback network broadcasts at their own convenience. Thus maximum flexibility is built into the system; not only can the transmitting stations send a file of previously recorded programs to stations joining the net, but also the receiving schools can repeat individual lessons or reschedule entire series.

#### INDIANA INTERLIBRARY TELECOMMUNICATIONS NETWORK

An example of a functioning telecommunications network is the one in Indiana which now links 22 public libraries, four State Universities and the Indiana State Library. The latter has a 33ASR TWX unit with a tape punch attachment which can transmit messages at up to 100 words a minute; the other libraries in the net have 33KSR's. Still other libraries, usually smaller ones, can tie into the net by telephone and be assigned to the nearest TWX installation.

To extend its library facilities to the medical community, the Indiana University Medical School joined the system and put in its own TWX unit. The local libraries will relay requests directly to the Medical

Center Library (without going through the State Library) and the Center will send back information through the network to the physician or will send materials directly to him.

The entire network serves to locate sources of information, to obtain references, and to arrange inter-library loans. Not only has the volume of loans been increased, but the rate of serving the user with references or other information has steadily increased.

Source material for the examples used came from:

☐ GENESYS

College of Engineering, University of Florida  
Gainesville, Florida 32601

☐ TUCC

P.O. Box 12175  
Research Triangle Park  
North Carolina 27709

☐ CATE Center

Building D, A&M University  
College Station, Texas 77843

☐ Indiana State Library

140 North Senate Avenue  
Indianapolis, Indiana 46204

#### MORE ON COMPUTERS AND LAW

**T**HE UNIVERSITY OF MICHIGAN is sponsoring a new symposium on computers and the law to be held June 7 and 8 on the university campus. Under the title, "Legal Implications of Computers—the Challenge of the New Technology," it will provide a forum for discussion of such related matters as computers and privacy, copyright and patent protection for computer hardware and software, and the regulation of computer transmissions.

The chairman and program director is Arthur R. Miller of the University of Michigan Law School. Professor Miller is co-chairman of the EDUCOM Task Force on Legal and Related Matters. Also participating in the symposium will be Dr. James G. Miller, Vice President for Academic Affairs, Cleveland State University, and EDUCOM's Vice President and Principal Scientist.

The symposium is open to all interested parties and is not confined to those in the legal profession. Additional information can be obtained by writing to I.C.L.E., 435 Hutchins Hall, The University of Michigan, Ann Arbor, Michigan, 48104 or to Professor Miller at the Law School there.



# interaction

## TITLE IX TESTIMONY

On February 8, Vice President James G. Miller and Director of Information Sciences Joseph Becker testified for EDUCOM before the Special Subcommittee on Education in support of legislation on the Networks of Knowledge Act of 1968, which is a part of H. R. 15067. Mr. Becker presented a brief statement of EDUCOM's position and submitted copies of EDUNET to committee members present. Dr. Miller then spoke to the questions which had been raised concerning network planning in progress and gave an account of EDUCOM's efforts thus far. The committee, which was chaired by Representative Brademas of Indiana, in the absence of Representative Edith Green of Oregon, expressed interest in the networking concept.

## SETA SYSTEMS CONFERENCE

A presentation on EDUCOM, its role and functioning, was given at the conference of the State Educational Television Authority in Washington on March 21 by Dr. Thomas Keenan, Director of Systems Planning. The purpose of the conference was to examine the many faces of educational technology in order to assess their implications for state educational television networks and to seek some patterns for beneficial coordination between ETV and other telecommunications traffic. Others on the program included Dr. Carroll V. Newsom, Vice President for Education of RCA and a Trustee at Large of EDUCOM, and Dr. Robert D. B. Carlisle of the State University of New York, one of EDUCOM's institutional members.

## ACM STUDY COMMITTEE

Dr. Thomas Keenan of the EDUCOM Research Office, has accepted an invitation from Chairman Daniel W. Jared to serve on the ACM-sponsored Ad Hoc Study Committee of Off-campus Graduate Education. The committee is concerned with the problems of the part-time graduate student who is working while attempting to complete his education. In keeping with the EDUCOM network concept, the study will be directed toward planning for a consortium of graduate schools linked by online realtime communication channels.

Dr. Keenan is also a member of the Curriculum Committee on Computer Science (C'S), a subcommittee of the Association for Computing Machinery. The

work of this committee has resulted in a report, "CURRICULUM 68—Recommendations for Academic Programs in Computer Science," which forms the major part of *Communications of the ACM*, Vol 11, No 3, March 1968.

## COMPUTERS IN MEDICAL EDUCATION

On April 4 Vice President James G. Miller represented EDUCOM and gave a progress report to conferees assembled at the University of Oklahoma Medical Center to discuss the Use of Computers in Medical Education. Also on the program was Dr. George E. Miller who is Chairman of the EDUCOM Task Force on Continuing Education.

## ETV PROGRAM ON CENTRAL FILE

On March 26 the live television program, "Opinion in Conflict," broadcast from Boston's educational station WGBH, featured EDUCOM's Director of Information Sciences Joseph Becker as one of the witnesses. The other witness was Emmanuel Mesthene, Director of the Harvard University Program on Technology in Society, and the issue was whether the Federal Government should develop a central computer file on every citizen. Examiners on the program, moderated by Lyman Kirkpatrick, were Gerald Berlin of the Massachusetts Civil Liberties Union and lawyer James D. St. Clair. The taped broadcast will be shown on stations in the ETV network on the East Coast.



Joseph Becker, Director of Information Sciences



# networking notes

This space will be used to report, as a matter of information, plans for, development of, or establishment of networks in various media outside of EDUCOM research programs.

---

New York City has started its first full-scale instructional computer program in its elementary schools. The network consists of instructional terminals in sixteen public schools, which are linked to a central computer. At present the computers are being used for drills in mathematics and spelling for elementary school students. The system was made possible by a \$2.5-million grant from the Office of Education.

The Southern Regional Educational Board has established a Council on Computer Centers and Computer Science Education and Research. Its purpose is to promote better interaction between the 200 or more institutions in the South which have computer installations. The work will be supported by grants from the ESSO Education Foundation and the International Business Machines Corporation.

The Federal Reserve System has announced its plan to develop a nationwide computerized communications network to link its Washington offices with the U.S. Treasury and with member banks. The proposed network will operate some 40 times faster than the present teletypewriter network, and its volume capacity will be 10 to 12 times greater than that of the present system. Included in the initial network will be 12 regional reserve banks and their 24 branches. At a later date some 6,000 member banks will be brought into the network.

Joseph Becker, Director of Information Sciences, and Wallace C. Olsen, Research Associate, of EDUCOM's Bethesda office, have drafted the chapter on "Information Networks" of the *Annual Review of Information Science and Technology* sponsored by the American Society for Information Science. The volume, to be published by Encyclopaedia Britannica under the editorship of Carlos Cuadra, will be available in October. Persons interested in specific aspects of network development during the past year are invited to communicate with the chapter authors.

In Oregon the State System of Higher Education has received recommendations, following a two year study by the Interinstitutional Committee on Computer Activities (ICCA), to set up an experimental network linking state institutions to existing computer centers. Small schools will have links with the computer centers at the ratio of one console per 500 students. The network will be used for management, CAI curricular development and improved college library operation.

In Connecticut a teletype network now connects the State Library, five public libraries and five academic libraries. Major use of the TWP facility has been to effect interloans and to locate books. In fact, the State Library uses it to find books for patrons of the two hundred public libraries not in the system. At present, interstate communications are under development.

Schools in seven towns in Carbon County, Wyoming, are using electronic blackboards to bring live demonstrations to their remote school system. The blackboards operate over two telephone lines, with one carrying conversation and the other transmitting images from a console which is operated with an electronic pen. With this network, schools can afford to pay hourly phone bills for lessons and thus avoid the cost of a closed-circuit television installation. Systems are also in use in such widely separated areas as Block Island, Rhode Island; Barrie County, Missouri; and Columbus, Indiana.

The New England Center for Continuing Education is studying technological devices and linking methods necessary to develop a network which will allow shared programs and resources for six New England state universities. The study is concerned with development of a multi-channel communications system which will enable the institutions to share information stored in a variety of files, including video and computer tapes, microfilm, and audiotapes, as well as printed documents.

Bell Telephone Laboratories has established a network with BELLREL—Bell Laboratories Library Real-Time Loan System—as its principal computer-aided system. It will link technical information libraries at the Murray Hill, Homedell, and Whippany offices of the company in New Jersey. The net will serve both to locate documents and answer questions in real-time.



## EDUCOM RESEARCH PROJECTS

From the Bethesda offices, on the outskirts of Washington, D.C., EDUCOM's small staff of researchers is handling a number of projects, under grant or contract, which will contribute to design and functioning of future networks. The principal investigator and coordinator for the projects is Joseph Becker, Director of Information Sciences. A precis of the active work follows for the information of EDUCOM members:

**Title:** National Biological/Agricultural Information Network

**Granting**

**Agency:** National Agricultural Library

**Started:** June 9, 1967

**End:** June 8, 1969

**Research Associate:** Harold B. King

**Purpose:** To develop a long-range network plan for strengthening biological and agricultural information communications among land-grant universities and the National Agricultural Library.

**Title:** Biomedical Communications Project  
**Contracting**

**Agency:** National Institutes of Health

**Started:** May 31, 1967

**End:** Nov. 30, 1968

**Research Associate:** Tadashi Mayeda

**Purpose:** To explore the design characteristics of a medical library communications network which can extend and accelerate the flow of information to the health professions.

**Title:** Library Digital Storage Study

**Started:** Dec., 1967 (Planning stage)

**Research Associate:** Wallace C. Olsen

**Purpose:** Currently an internal project, the study is to provide detailed information on library book population, average size of volumes and pages, and patterns of use and retrieval, in order to examine the feasibility of digital storage.

Other studies are being conducted by  
EDUCOM at member universities.

**Title:** Author Language Study

**Granting**

**Agency:** Office of Naval Research

**Started:** Jan. 1, 1968

**End:** Dec. 30, 1968

## NEW MEMBERS AND REPRESENTATIVES

At the March meeting, the Board of Trustees accepted the University of Connecticut as a full member, pro tem, pending approval of the Council. This brings total membership to 89. A map on the back cover shows the distribution by state and province.

New institutional representatives include:

at Michigan State University

Robert H. Davis

Director of Learning Service

at the University of Missouri

William Stucker

Assistant to the Vice President for Graduate  
Study and Research

at the University of Rochester

Everett M. Hafner

Professor of Physics

at Syracuse University

Kenneth Fishell

at Texas Technological College

Richard F. Barton

at Western Michigan University

George G. Mallinson

---

**Principal**

**Investigator:** Karl L. Zinn, Center for Research on Learning and Teaching, University of Michigan.

**Purpose:** To compare and analyze the author languages used in assembling and entering material into computers for CAI and to identify additional requirements of authors not currently met.

**Title:** Diffusion of Computer Systems in Higher Education

**Started:** January 1, 1968

**End:** Open

**Principal**

**Investigator:** Charles W. King

**Purpose:** To study the dynamics of the process by which computer usage is adopted and diffused across and within colleges and universities in order to develop a guide for more efficient introduction and utilization.



## LOUIS RADER JOINS BOARD

At its March meeting, the EDUCOM Board of Trustees elected Dr. Louis T. Rader as a Trustee at Large. The new member is Vice President and General Manager of the Industrial Process Control Division of the General Electric Company at Charlottesville, Virginia. Prior to rejoining General Electric in 1964, Dr. Rader was President of the UNIVAC Division of Sperry Rand Corporation. Other corporate positions held by Dr. Rader have been Group Vice President—U.S. Commercial and Director of International Telephone and Telegraph Corporation. He has also been manager of engineering in the industrial control department of General Electric, as well as General Manager of its Specialty Control Department.

Louis Rader is a graduate of the University of British Columbia (BSEE) and received both his MSEE and his Doctorate in electrical engineering from the California Institute of Technology.

The new trustee is a Director of the Electronic Industries Association, a member of the Board of Directors of the Business Equipment Manufacturers Association, a member of the Science and Technology Committee of the U.S. Chamber of Commerce, a Trustee of the Robert A. Taft Institute of Government, New York City and a member of the Board of Directors of the General Learning Corporation. He is a licensed professional engineer in both Illinois and New York. Dr. Rader is also a member of the American Society of Engineering Education, American Association of University Professors and a fellow of the American Institute of Electrical Engineers.



*Louis T. Rader, G.E. Vice President*

## meetings and conferences

- May 21-23    **Annual Convention of the National Microfilm Association**  
Conrad Hilton Hotel, Chicago  
S/C    NMA  
Prince George Street  
Annapolis, Md.
  
- June 3-5    **National Conference of the Computer Society of Canada**  
Kingston, Ontario, Canada  
S/C    Computer Society of Canada  
Box 445  
Kingston, Ontario
  
- June 11-13    **Annual Conference, Council of Social Science Data Archives**  
University of Pittsburgh  
Pittsburgh, Pennsylvania 15213  
S/C    Council of Social Science Data Archives  
605 W. 115th Street  
New York, N.Y. 10025
  
- June 25-27    **Annual Computer Group Conference**  
International Hotel  
Los Angeles, California  
S/C    Institute of Electrical and Electronics Engineers  
Suite 1920, 3600 Wilshire Blvd.  
Los Angeles, California 90005
  
- June 30-  
July 3    **Annual Convention, National Cable TV Association**  
Boston, Massachusetts  
S/C    National Cable TV Association  
1634 Eye Street, NW  
Washington, D.C. 20005
  
- Aug. 27-29    **Association for Computing Machinery National Conference and Exposition**  
Las Vegas, Nevada  
S/C    Richard B. Blue  
TRW Systems Group  
Bldg. R-3, Room 1144, One Space Park  
Redondo Beach, California 90278

\*S/C identifies the Sponsor or Contact  
Listings are for information only and do not constitute an endorsement; institutional representatives are encouraged to submit notification of meetings of interest to a broad range of faculty and staff of member organizations. A lead time of about three months is desirable.



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## Distribution of EDUCOM Members by State

May 1968



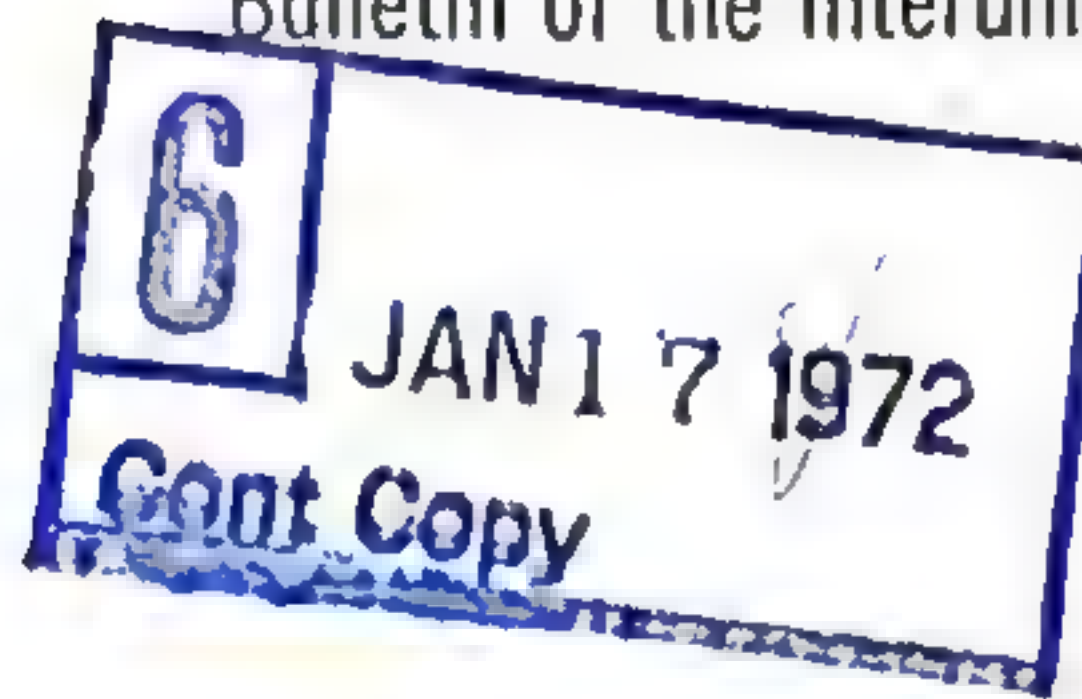


September 1968

Volume 3, Number 4

# EDUCOM

Bulletin of the Interuniversity Communications Council (EDUCOM)





# EDUCOM BULLETIN

Vol. 3, No. 4

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EDUCOM Programs
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New Members and Representatives

**On the Cover.** EDUCOM's new Boston Headquarters are located in the white building that is just to the right of center. Beacon Hill, the Public Gardens, and the Boston Common are in the foreground. The three tall buildings at the right form part of the new Government Center. The Massachusetts General Hospital is located in the large complex to the left of EDUCOM.

*(Photo courtesy of Aerial Photos of New England.)*

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Editorial offices: 100 Charles River Plaza, Boston, Mass. 02114 Tel. 617-227-1805



# OCTOBER COUNCIL MEETING

## TO REVIEW EDUCOM PROGRAMS

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The Annual Meeting of the Interuniversity Communications Council will take place on Tuesday and Wednesday, 15 and 16 October 1968, on the Boston University campus. Hosts for the conference are the four Massachusetts EDUCOM members—Boston University, University of Massachusetts, Northeastern University, Tufts University—and the New England Board of Higher Education. The Tuesday afternoon and both Wednesday sessions will be open to all registrants.

### EDUCOM'S NEW PROGRAMS TO BE THEME

The open sessions will be devoted to EDUCOM's three active programs—EIN, POISE, and CLC. In individual sessions, the cognizant staff members will discuss the status and plans of each program and invited panelists will present critical reviews of the concepts involved. Between sessions, the host institutions have scheduled demonstrations of educational communications media.

The Educational Information Network project is funded by the Office of Education and work has been authorized to start while the final negotiations are in process. The purpose of EIN is to establish and administer a system through which computational capabilities of colleges and universities will be made accessible to users in other colleges and universities. Preliminary discussions have already been held with many EDUCOM members concerning participation, and, as a first step in the activation of the project, a small, geographically representative group has been selected to serve as the resource nodes. Under the guidance of its Executive Director, Thomas Keenan, system descriptions will be collected, newsletters and a computational-capabilities catalogue will be published, and a continuing analysis of problems and progress will be maintained.

The Practice-Oriented Information System Experiment is set up to provide a base of knowledge, techniques, and experience to be applied to the development and implementation of computer-based systems

to serve those professionals who practice in cross- or inter-disciplinary areas. The initial endeavor will be to develop techniques of retrieving selected bibliographic information from files oriented to serve particular disciplines. POISE projects will include the collection and dissemination of information that describes existing and prospective information systems, consultation to developers of systems, and development of tools and methods to be used in the construction of information systems. POISE will also attack the problems associated with accessing data from a number of diverse data bases, including data-format description and identification of useful information.

The Community Learning Center program will utilize latest advances in technology and the social sciences to build personalized educational programs for a community's *learner members*. Designed to offer courses at the junior-college and postprofessional levels, the CLC's will offer a number of unique features. Distinguished academicians will create a body of multimedia courses relevant at the neighborhood level. Trained educational advocates will be based in each center to provide broad counseling and support services to participants, and flexible work/study programs will be devised for the user. Although community-based and -oriented, the Centers will draw on university resources as well as on the input of business, industry, and private and public organizations.

### TENTATIVE PROGRAM

#### TUESDAY, 15 OCTOBER

<b>AM</b>	Registration	<b>PM</b>	EIN Session
	Business Session		Demonstrations
	Luncheon (Invited Speaker)		Reception

#### WEDNESDAY, 16 OCTOBER

<b>AM</b>	CLC Session	<b>PM</b>	POISE Session
	Luncheon		Demonstrations



## BOSTON FACILITIES

Attendees at the Fall Meeting will be housed in the Somerset Hotel on Commonwealth Avenue and in the Fenway Commonwealth Motel. The EDUCOM reception will be in the Somerset on the evening of the 15th. All other events, including luncheons, will take place in the Sherman University Union, on the Boston University Campus. Sessions will be held in the Conference Auditorium of the Union and the demonstrations will go on in the adjacent spaces. The latter is a way of bringing "tours" directly to the conference location, although arrangements will be made for visits by individuals to other institutions in the Boston area. Between and after sessions, there will be demonstrations of remote computing, academic grading methods, computer-assisted in-

struction, television, speech compression, and a teacher's problem laboratory.

## REGISTRATION INFORMATION

Preregistration kits containing a detailed program and hotel and luncheon reservation forms will be mailed to Institutional Representatives, to invitees, and to those who have requested them. Members of the EDUCOM institutions with an interest in any of the programs are welcome. Registration will also take place in the Sherman University Union before the various sessions. There will be no registration fee for Institutional Representatives, their guests, and attendees from those institutions that have received specific invitations. The fee for others attending will be \$15.

# BOSTON HEADQUARTERS OPENED

EDUCOM headquarters moved in mid-June from its temporary offices in Cambridge to 100 Charles River Plaza in Boston. The map on the outside back cover of this issue of the BULLETIN will give you an idea of the central location of EDUCOM's new address. Charles River Plaza is on Cambridge Street, within walking distance of the new Government Center and the downtown business district. Nearby are public transportation stations on the MBTA, which brings the many centers of education and research in the Metropolitan District within easy reach. Logan International Airport is a short taxi ride away, and access to main automobile routes (Massachusetts Turnpike Extension, Southeast Expressway, Northern Artery, and Route 95) is just down the street, via Storrow Drive. Visitors to EDUCOM will find convenient accommodations directly across the Plaza from the offices at the soon-to-be-completed Holiday Inn.



100 Charles River Plaza, Boston, EDUCOM's new headquarters



# MEDICAL DIAGNOSIS BY TELEVISION

---

Since 1 June 1968, Dr. Kenneth T. Bird of The Massachusetts General Hospital (MGH) has been experimenting with diagnosing illness over television. He has turned MGH's Logan International Airport Medical Station into a television studio and, three miles away, a small emergency ward at the hospital into a television control studio.

The telediagnosis program, which is supported by the Public Health Service of the U.S. Department of Health, Education, and Welfare, is in the first year of a three-year pilot program for the whole country. Eventually, it is hoped that a telediagnosis network might be set up with hospitals from coast to coast joining in.

Such a wide-ranging network would permit the medical world to offer services on a scale the like of which has never before been attempted, nor imagined possible. For example, consultations with a specialist or teams of specialists at distant teaching hospitals could be more easily arranged. The busy doctor would no longer have to waste valuable hours in roundtrip travel between his own institution and a community hospital miles away. He could be called in to consult on an emergency at a moment's notice and be on the case in the time that it would take him to walk from his hospital offices to the television control station—perhaps just down the hall. If the telediagnosis systems were tied in with the Telstar or Early Bird satellites, it is not impossible that consultations could be held with the patient and the teams of specialists separated by continents.

Dr. Bird originally conceived of the system as an answer to the problem of the increasing shortage of doctors. However, the telediagnosis system also has nonmedical applications. Recently, Dr. Bird tested its possible educational applications when he used it to lecture on occupational lung disease to Harvard School of Public Health students. He reports that he finds it also to be an excellent in-service teaching device, and special training programs are now being set up for the

Logan nurses. Once the system is established, MGH also plans to give courses in first aid to the Logan-based Massachusetts State Police. Weekly nursing reports from Logan are presently being taken over the system and the Social Service Department will soon use it to take case histories from patients admitted there.

The telediagnosis system was featured in a recent issue of the *MGH News* [27, No. 2, 1, 3-4 (July-Aug. 1968)], where Dr. Bird is quoted as saying, "Within a couple of years, I can see any peripheral hospital joining a telediagnosis network. Using Telstar and Early Bird, you can have any number of community hospitals tied in."

As for the more distant future, he believes that a physician will be able to remain in his office for the examination of his bed patients in hospitals.

"Telediagnosis I visualize as part of a much greater system of telemedicine. Telemedicine would provide a large variety of services from a distant physician."

The 12 500-Hz, two-way microwave system was designed by Richard Oldham, Assistant Director of the Educational Division of WGBH, Boston's noncommercial television station. He planned the closed-circuit telediagnosis system to be as unobtrusive as possible so that any mechanical intrusion on the doctor/patient relationship might be kept to a minimum. To this end, a television camera will soon be installed out of view behind a two-way mirror. A special zoom lens imported from Japan will be fitted to the hidden camera for closeups, which should relieve the patient of any anxiety that he may have about the proximity of strange-looking equipment moving in on him.

The system was installed by the Raytheon Company and includes \$80 000 worth of the most sophisticated equipment that is available for black and white TV transmission. Dr. Bird hopes that in the next phase they will be able to include color television, which would provide yet another dimension to aid in diagnosis.



# ONE FACET OF INFORMATION HANDLING

**Carl E. Nelson**

International Business Machines Corporation, San Jose, California

In many fields of technology, the need for a product precedes the ability to produce it. In the information storage and retrieval field, this has not been essentially true. For several years, we have had the capability of producing even very sophisticated computer-oriented storage and retrieval equipment using photographic media. Yet only recently have industry, education, and business begun to crystallize their requirements so that systems can be developed for use. However, they have all become aware of the increased need for better means of handling information.

To put the problem into perspective, let us hypothesize a bar chart that shows, for one, the amount of technical information available up to the time of the invention of the electric light. Let us assume that on our chosen scale this bar measures four inches high. Using the same scale, a bar representing the amount of technical information generated since World War II would then be as high as a 70-story building. In many fast-developing areas, one must learn 20% more each year just to keep abreast of his field and avoid becoming obsolete.

With information expanding at such a rapid rate, it forces development of new, more-efficient methods of organizing and handling it. The result has been the advent of quite a number of devices for the manual or automatic storage and retrieval of information. These devices have been generally of three types: computer, microimage, or a combination of the two.

It is not possible in this brief article to describe the entire spectrum of available information storage and retrieval equipment, their varied characteristics, fields, and methods of use. Therefore, one area has been singled out to give a small glimpse of the trend.

Present technology permits entry into a body of information stored in a computer in either digital or analog form, and also permits retrieval in graphic form. Entry of information to the computer can be made by means

of conventional punched card, magnetic tape, data terminal, or by optical document scanning. When scanning a microimage, for instance, the image is broken into millions of minute areas, and each is identified and located (within the computer store) either by digital or analog methods.

## STORAGE AND RETRIEVAL METHODS

Although laboratories are finding many new approaches to recording information, including laser-beam deflection and holography, three basic methods of recording and retrieving information from computer tape or disk are in commercial use.

### Charactron Cathode-Ray-Tube Method

The Charactron cathode-ray-tube (CRT) employs a mask which has a chosen font of alphanumeric characters mounted inside the tube. A computer-controlled electron gun directs an electron stream through the proper character on the mask. By programmed deflection, the characters are successively focused on the phosphor screen of the tube. Using optical-lens equipment, the image on the face of the tube is then focused on a sensitized medium which records it.

### Coordinate-Matrix Method

The coordinate-matrix method has some similarity to the previously described method in that a stream of computer-controlled electrons is directed onto the phosphorized inner face of the CRT and the image on the front of the tube is then optically focused onto a sensitized medium for recording.

However, there is a fundamental difference between the way in which the information is stored in the computer and the way in which it is graphically displayed. Assume that a rectangle is made into a grid, with 4000



lines drawn from the short side and 6000 lines from the long side. This would divide the rectangle into  $24 \times 10^6$  boxes. Each box represents an assigned coded location stored in the computer. During recording, an image is formed by storing a coded signal in the computer so that, when the image is requested and displayed on the CRT, it will assume the proper position in the matrix.

When the recorded image is displayed, it consists of dots or strokes, depending on the chosen method; to the eye, they appear continuous. This method has greater flexibility than the Charactron method because it is not limited to the characters of the font contained on the mask, but can generate any desired shapes, curves, or patterns.

#### Electron-Beam-Recorder Method

The electron-beam recorder (EBR) is novel in that the beam is focused to a small point—as small as  $1 \mu$ —and is programmed to write directly on the sensitized medium. The sensitized medium is drawn into a vacuum in which an electron gun is contained and the image is written on it before it moves out of the vacuum. This method allows the full energy of the beam to be used in recording and avoids any loss in quality which might be introduced by either the phosphor surface or the optical system. Use of the full energy of the beam also permits higher recording speeds because the speed of most designs is limited by the sensitivity of the recording medium.

#### GENERAL CHARACTERISTICS

Several companies have announced magnetic tape to microfilm recorders. These include Stromberg-Carlson, Incorporated, Computer Industries, Incorporated, California Computer Company, 3M Company, Eastman Kodak Company, Information International, Incorporated, Link Group of Litton Industries, Electronic Arts Corporation, and others are on their way.

Features of interest are that most will record on 16- or 35-mm film and some are offering formatting on microfiche. They record at reduction ratios equivalent to conventional microfilm practice. The speed of recording is very high: from 30 000 to 90 000 characters per

second. Even higher speeds are possible. Because the recorded image is light and the surrounding background is dark, the film, when developed, is a positive. This has some disadvantages if hard copy is desired, so some companies are arranging for reversal development of the film so that a negative can be obtained directly.

All but 3M Company use silver emulsion film and process off line. 3M uses dry silver film and processes on line by heat. The film may be viewed on an integral inspection viewer directly after development.

The magnetic media to microfilm recorders tells a story of importance.

- So much information is being generated by computers that printed copy is becoming a problem.
- Recording on microfilm not alone reduces the volume of the records to be retained, but allows the information to be organized more readily for future search, retrieval, and viewing or copying.
- A step further would provide coding the film for automatic search in any desired degree of depth.
- Any microfilm inherently can be adapted for automatic or manual duplication, printout, or remote transmission.
- Perhaps of greatest importance is the awareness that we have arrived at a stage in information output from computers where it has become so voluminous and unmanageable that we are being forced into a better method of storing and using it.

This brief description of one area of information handling is representative of the kind of attention being given the problem of improved information handling. Millions of dollars are being spent in research and development of mechanisms to meet the challenge of making desired information easily available to the scholar, the scientist, the doctor, the lawyer, the engineer, and all who need it. It is likely that, as the fund of information continues to mount, the demand for more and better information storage and retrieval equipment will become so pressing and so essential that we will have no alternative other than to meet the challenge by extending the use of existing equipment and systems and development of even better systems.



## RECENT ADDITIONS TO BOARD

We are honored to announce that John J. Sharry, Institutional Representative of The University of Alabama, and William L. Stucker, Institutional Representative of the University of Missouri, have joined the EDUCOM Board of Trustees.

Professor Sharry is the Director of the Office of Learning Resources at The University of Alabama (Birmingham) Medical Center and also is the Chairman of the Department of Prosthetic Dentistry of The University of Alabama School of Dentistry. He is filling the position left vacant by the resignation of Dr. J. F. Volker, Vice President for Birmingham Affairs of The University of Alabama.

A native of Somerville, Massachusetts, Professor Sharry took his B.S. degree from Tufts College in 1945 and his D.M.D. from Tufts College Dental School in 1949. He was affiliated with the Jefferson-Hillman Hospital from 1949 to 1951, first as an Intern and then as Resident in Oral Surgery. He held a Kellogg Fellowship in Prosthetics in 1951 at Tufts College Dental School and in 1953 at The University of Chicago Zoller Clinic.

Professor Sharry's present activities include consulting to the Veterans Administration Hospitals in Birmingham, Tuscaloosa, and Tuskegee, to the U.S. Army at Fort Benning, and to the U.S. Air Force at Keesler Air Force Base. Also, he serves as Diplomat of the American Board of Prosthodontics and as Prosthetic Representa-

tive on the AADS National Committee on Occlusion in Curricula. He is a member of the Board of Editors of the *Alabama Journal of Medical Sciences* and a past Editor (1960-1964) of the *Alabama Dental Review*. He has published many scientific and professional papers and is the author of *Complete Denture Prosthodontics* (McGraw-Hill Book Co., Inc., New York, 1962).

William L. Stucker is Assistant to the Vice-President for Research and Graduate Studies at the University of Missouri, working with computer programs and general educational programs development. He also assists the Office of the Executive Director for Health Affairs and the Office of the Consultant on Medical Affairs to the President of the University. Mr. Stucker is assuming the trusteeship that was formerly held by Dr. Ward Haas, who left the University of Missouri to join the firm of Warner-Lambert.

Prior to his association with the University of Missouri, Mr. Stucker served with the Public Health Service of the U.S. Department of Health, Education, and Welfare as an education specialist in training and curriculum development. His background includes a period with The University of Texas—Medical Branch (Galveston) as director of educational and research services.

The new EDUCOM Board member is a 1954 graduate of Texas Technological College; he received his M.Ed. degree from there in 1957. Mr. Stucker also holds an Ed.S. degree from Indiana University, where he concentrated on administration, utilization, and production of educational media.



John J. Sharry, The University of Alabama



William L. Stucker, University of Missouri



## networking notes

This space will be used to report, as a matter of information, plans for, development of, or status of networks in various media outside of EDUCOM research programs.

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The Courant Institute of Mathematical Sciences of New York University has established a computer network that ties it in, by telephone lines, to centers in Dallas, Texas, Troy, New York, and Weston, Illinois. Courant's work for the U.S. Atomic Energy Commission can be handled on a remote batch basis, and, with the Courant-developed multiplexers, the system will be able to support 16 users.

UNIVAC's Information Services Division is going to operate a nationwide network of processing centers, using its 1108, 418, and 9300 systems. The 9300 will function from some 22 cities and will be linked to the larger 1108 and 418 systems in four cities via DCT-2000 terminals.

An earth-sciences computer network built around a central IBM 360/65 system has been put into operation by the U.S. Department of the Interior. The main computer is located in Washington, D.C., and satellites are at U.S. Geological Survey facilities in Menlo Park, Denver, Flagstaff, and Rolla.

ORBIT is the name of the Household Finance Corporation On-Line Real-Time Branch Information Transmission, a countrywide network joining more than 1200 of its branch offices to an IBM 360/65 complex in Chicago. Support hardware has six IBM 2314 disk storage units, six remote multiplexers, and 1200 IBM 1971 terminals.

From its Seattle headquarters, Safeco Insurance Company has linked by telephone lines the IBM 360/20 there with nine other model 20's in its remote offices. The teleprocessing network carries information during the working day and at night it updates the company's master file.

A law-enforcement computer network will be established by the State of Maryland to serve the State Police, Correctional Services, Parole and Probation, and Juvenile Services Departments. The network will function around two IBM 360/40's and will be linked with the FBI National Crime Information Center and the Baltimore Police Department Computer Center.

## interaction

### FEDERAL LIBRARY COMMITTEE

Joseph Becker, EDUCOM's Director of Information Science, spoke on libraries and information networks before a meeting of the Federal Library Committee last May in the Library of Congress. The Federal Library Committee is made up of representatives from the departmental libraries of the government.

### BARUCH GIVES PAPERS AT STONY BROOK AND EDINBURGH

On 7 June, EDUCOM's President, Jordan Baruch, gave a paper on medical information systems at the Fourth Stony Brook Conference on Advances on Computing. In August, he presented an invited paper, "A Generalized Medical Information Facility," in Edinburgh, Scotland, at the IFIPS Conference (International Federation of Information Processing Societies).

### LAW OF COMPUTERS

Professor Arthur R. Miller of The University of Michigan, and Chairman of EDUCOM's Panel on External Affairs, organized a two-day symposium at Michigan on "The Law of Computers: The Challenge of a New Technology." Transcripts of the meeting, which was held on 7 and 8 June, can be ordered from the Institute of Continuing Legal Education, 432 Hutchins Hall, The University of Michigan, Ann Arbor, Michigan 48104.

### EDUCOM REPRESENTED ON PANELS

Dr. James G. Miller, EDUCOM Vice President and Principal Scientist, was the Chairman of a panel on 12 June at the Fourth Annual IEEE International Conference on Communication. Dr. Thomas Keenan, EDUCOM's Director of Systems Design, was a member of the panel and spoke on the Educational Information Network (EIN), one of EDUCOM's current programs. Dr. Miller was also one of the featured speakers at the two-day Michigan symposium on "The Law of Computers." His topic was "The Computer, Its Function and Place in Modern Society."

### COMMUNITY LEARNING CENTER MEETING

Another new EDUCOM program, the Community Learning Center (CLC) concept, was introduced and discussed at a meeting on 19 July at EDUCOM headquarters in Boston. Present were representatives from areas such as educational publishing, information technology, urban affairs, educational television, and educational testing. Reactions and contributions of the participants will be integrated into the formal presentation of the CLC experiment.



# meetings and conferences

19-21 Sept. **Symposium on the  
Use of Computers in Clinical Medicine**  
State University of New York, Buffalo

S/C Clinical Information Center  
Edward J. Meyer Memorial Hospital  
462 Grider Street  
Buffalo, N.Y. 14215

18 Oct. **Annual Symposium on  
Application of Computers to the  
Problems of Urban Society**  
New York

S/C General Chairman  
Computer Methods Corporation  
866 Third Avenue  
New York, N.Y. 10022

20-23 Oct. **Systems and Procedures Association  
International Systems Meeting**  
St. Louis

S/C Richard L. Irwin  
24587 Bagley Road  
Cleveland, Ohio 44138

19-22 Nov. **National Association of  
Educational Broadcasters Convention**  
Washington, D.C.

S/C NAEB  
1346 Connecticut Avenue NW  
Washington, D.C. 20036

2-3 Dec. **Second Conference on  
Applications of Simulation**  
Hotel Roosevelt, New York

S/C Ralph Layer  
Association for Computing Machinery  
211 East 43 Street  
New York, N.Y. 10017

9-11 Dec. **Fall Joint Computer Conference**  
San Francisco Civic Center

S/C William Davidow, General Chairman  
395 Page Mill Road  
Palo Alto, Calif. 94306

S/C identifies the Sponsor or Contact.

# NEW MEMBERS AND REPRESENTATIVES

Membership in the Interuniversity Communications Council reached 93 when the Council elected the following new applicants at the May meeting in Chicago.

University of Maine (Orono, Maine)  
Oakland University (Rochester, Michigan)  
The Ohio College Library Center (Columbus, Ohio)  
University of Saskatchewan (Saskatoon, Saskatchewan)

*Pro tem* members confirmed by the Council are

The University of Connecticut  
Medical College of Georgia  
Naval Medical School of the  
National Naval Medical Center\*  
New England Board of Higher Education\*  
University of New Hampshire  
The Ontario Institute for Studies in Education  
Syracuse University  
Texas Technological College  
University of Toronto  
Western Michigan University

Institutional Representatives for the new members are

John W. Dunlop (University of Maine)  
General Manager, Maine ETV Network

Dr. D. B. Varner, Chancellor  
Oakland University

Frederick G. Kilgour, Director  
The Ohio College Library Center

John A. E. Bardwell, Assistant to the President  
University of Saskatchewan

\*Consulting Members.

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11-13 Dec. **Computer Applications in the  
Earth Sciences:  
Workshop on Experiment  
in Sampling**  
The University of Kansas, Lawrence

S/C Richard Treece  
University Extension  
The University of Kansas  
Lawrence, Kans. 66044

*Listings are for information only and do not constitute an endorsement. Institutional representatives are encouraged to submit notification of meetings of interest to a broad range of faculty and staff of member organizations. A lead time of about three months is desirable.*



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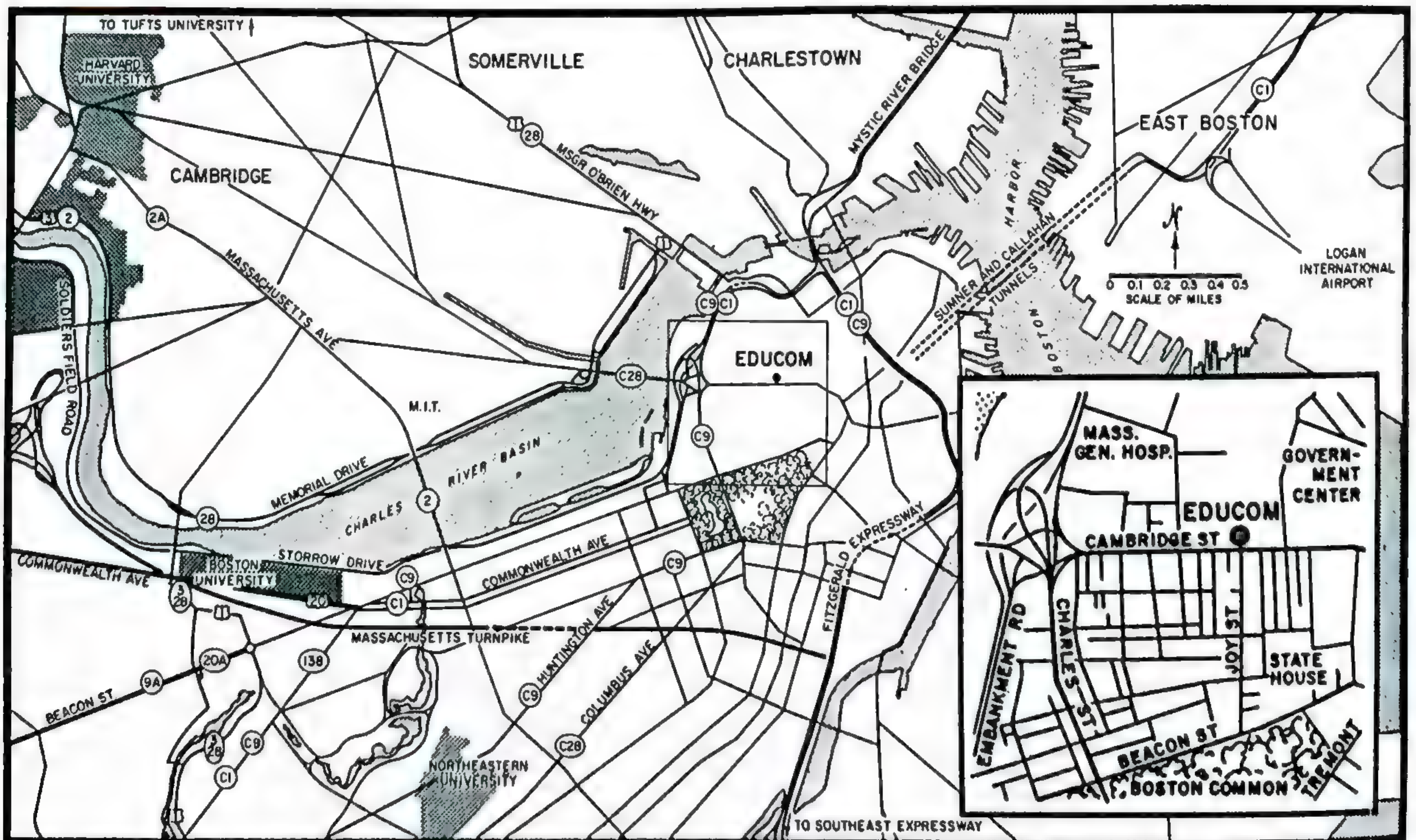
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(Back Cover)

**On the Cover.** This issue's cover features the second of Don Mittleman's examples of computer art. Both are explained in the lead article, which is one of two signed articles taking up most of this issue. This follows the expanded policy of featuring such material as often as possible. Lcdr. Inman's article is published with the permission of the U.S. Naval Academy; it is scheduled to appear in the summer issue of the Bureau of Naval Personnel's *Naval Training Bulletin*.

**Photo credit.** Official U.S. Navy Photograph—SPA 11933A, (page 5).

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# RANDOM ART

Don Mittleman

Director, Computer Center, University of Notre Dame

The legitimacy of computer art is a question to be faced by art lovers who speculate about such things. In the sense that an expression of feeling is perceived when viewing computer art, and under the dictum that this is the only requirement of an art object, computer drawings should be considered art. Expressions of response to the drawings, by individuals, ranging from "I like it," "It's good," etc., to "It's terrible," "It leaves me cold," "Ugh!" etc., have indeed shown that there is no unanimity of opinion concerning computer art as an art form. Yet, thus far, encouragement has exceeded discouragement, and this, I would venture to say, is a reasonable measure of acceptance. Computer art is really art because people respond to it just as they have previously responded to innovative art forms.

If the purpose of using the computer were to create a drawing by employing techniques duplicating human capabilities, I, for one, would seriously question the legitimacy of the work. The computer has characteristics that can be used both to augment and transcend human characteristics, and it is only by using these capabilities that newness is introduced into the art form and thereby into the human experience. My interest lies in using the computer to produce drawings that cannot be manually created and currently permeates my efforts in this area. Just one facet is explored in the drawings shown on the covers of this issue and the previous one.\*

The human artist approaching an empty canvas may make one or several brush strokes on the canvas in what he considers to be a random way. This beginning would normally be followed by additional strokes also placed in a random fashion, or perhaps not so random but placed to create an overall impression in the artist's mind that what he is producing on the canvas will be *viewed as random*. But, in fact, as he progresses toward completion of his painting, he will probably make *corrections* so as to achieve an effect that is to his eye most nearly random. And when he is satisfied that the effect before him is perfectly random,

he will stop. Visually and emotionally, he has created, *in a random way*, an art object.

In order to produce a computer drawing "at random," other factors must come into play. In designing the snowflake or rosette pictures illustrated on the cover, instructions to the computer were based on the knowledge that the computer had access to a "random-number generator" and that we could vary the step size of each pen stroke by 0.005 in. We began by imagining a square canvas (10 × 10 in.) and instructing the computer first to select from the random-number generator (1) two numbers that would specify the center of one of the rosettes. (Obviously here, as well as in the random choices to be described subsequently, limits on the magnitude of the random numbers were specified beforehand to ensure that the rosette would lie within the square.) Next, two other random numbers were selected, the first specifying a direction (2) and the second specifying a radial distance from the center of the rosette in that direction (3). While no restraint need be placed on the direction, the distance from the center is constrained to be less than the distance from the center to the nearest edge of the square.

A second point on the rosette is determined by randomly selecting another direction (4) and another radial distance (5). The angle of the second direction (4) was chosen to be small and the second distance (5) was to be not too different from the previously determined radial distance (3). The first and second points thus determined are to be the end points of a line segment drawn by a plotter. A third point is determined by selecting two additional random numbers to serve in the same way, (4) and (5), as above. This procedure could be continued until the circle is completed. At first, we completed only one-sixth of the circle and then repeated the pattern five more times to complete it. Each rosette pattern is thus constructed as a single, continuous, closed curve, although the snowflake illustration itself shows that there are many overlays with the same center. This is indeed the case. After the first series of single curves is drawn, the plotting equipment, under the direction of the computer program, is

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\*EDUCOM 4, Nos. 1 and 2 (1969).



stopped. A second series of single curves with the same centers is generated, using the random-number procedure as above, and then executed by the plotter. We experimented with the number of rosettes in one snowflake design and found that between 8 and 12 rosettes produced satisfying effects. Eight rosettes were used in the illustration.

While most of the rosettes appear to be hexagonal in shape, the computer program did select from three possibilities. In 20% of the instances, a pentagonal shape was to be chosen; in 60%, the hexagonal shape; and in the remaining 20% a heptagonal shape. Thus, even this general characteristic came as a surprise when it first appeared.

Stopping after each series permits further choices, which may or may not be made randomly. These pertain to the color of the paint and the size of the "brush" (actually, a hollowed pen point). The first design is generally drawn with black ink and a fine point on inexpensive paper. Based on our experience and taste, the drawing is reproduced by using a variety of watercolors or oils and varying pen-point sizes. Because the random-number generator should not be expected to produce the same sequence of numbers for several thousand years, and because we can never reproduce exactly the colors that were used, the drawing on the cover is a truly unique design.

While random numbers played an integral part in the creation of the picture, the randomness, when viewed, seems lost. Critics have referred to the design as being preconceived, precise, orderly, having recognizable form and internal relationships, etc. And, it must be admitted, their criticism is not unjustified. After numerous discussions on this point, I began to suspect that the randomness that I knew was inherent in the picture was lost to the viewer because of size. An attempt to make the picture look more random by increasing the size of the line segments failed because of mechanical difficulties. Another way to represent randomness visually as generated via a computer had to be found. Eventually, the idea represented by the straight-line drawings suggested itself.

A golden rectangle was selected to contain the design. Four random-numbers were used to determine two points within the rectangle. A line segment containing the two points and lying within the boundaries of the rectangle was then drawn. Looking ahead, different color values for the line segments could be obtained by going over a line already determined a variable number of times. Line width could also be made a random variable since it is possible to draw successive line segments such that the distance between these was less than the width of available pen points.

With these factors as random variables, we experimented with rectangle size. The picture presented on the cover of the preceding issue of *EDUCOM* (4, No. 1) was obtained by overlaying three such rec-

tangles. Careful examination will show that the positioning of the random lines is not the same in any two of the rectangles; that is, one is *not* an enlargement of another. There are three separately determined rectangles that have been superimposed. The ability to superimpose one rectangle on another further enhances the capability of the human artist to compose different effects according to his own tastes.

In the generation of each drawing, the plotter was programmed to stop after it had made 20 strokes. This permitted color or pen-size changes and added additional random variables insofar as these qualities were concerned.

For myself, and for those critics who had previously commented on the lack of randomness in the snowflake drawing, the feeling of randomness does seem to come through. Personally, I attribute this to size: the size of the random line segments in the rosette drawings is too small to be discernible as random. This phenomenon has analogs: the motions of gas molecules contained within a vessel are thought of as being randomly distributed, although unseen by the human, whereas the pressure of the gas on the walls of the vessel, as seen by the human observer, appears uniform.

The two drawings shown are from a continuing series of experiments in computer-generated and computer-assisted art. It is our thesis that art produced as a result of human/computer interaction is indeed a genuine art form. Whether it is good or bad art begs an answer based on subjective analysis and personal taste. But the fact that the computer should be used in this fashion to produce drawings of this type is incontrovertible. The potential in a method that transcends man's capabilities when unaided by the computer and the plotter cannot be ignored and should be explored.

During the writing of this, I have often used the pronoun "we"; the "we" refers to Leonard Kilian, who is responsible for the programming, and John Michalski, who is responsible for the execution of these drawings. Expressions of favor I gladly share with them; I assume responsibility for the rest.

## BIOMEDICAL COMMUNICATIONS STUDY COMPLETED

The EDUCOM research staff, under the direction of Vice President Joseph Becker, has completed for the National Library of Medicine a two-year study that will aid in the development of a biomedical communications network. Data about the health-sciences environment and the health professions were gathered, analyzed, and submitted in 13 Research Memoranda. The most ambitious of these is a compendium, which can be continuously updated, prepared by Research Associate Tadashi Mayeda and titled, *Guide to Facilities, Capabilities, and Programs of Medical Schools in the United States*.



# COMPUTER-ASSISTED EDUCATION AT THE NAVAL ACADEMY

LCDR Richard P. Inman, USN  
Director, Academic Computing Center  
U.S. Naval Academy

One of the major CAI development programs in the nation is going into its third year at the U.S. Naval Academy. The Annapolis plan is to develop and use computer-assisted techniques to increase the effectiveness of naval-officer education\* at the service academy. This program is sponsored by the Bureau of Naval Personnel. Included in it is a joint effort on Multi-Media Course Development by the Navy and the U.S. Office of Education. Many of the courses under development are applicable to institutions of higher education throughout the country. A large number of educators have already visited the Academy and the Academic Computing Center there, which is responsible for the program.

Computer-assisted-instruction course materials are being developed to permit the midshipman student to proceed at his own rate of learning. The computer will keep track of his pace within the course and will monitor his responses to match them against the desired performance objectives. The Academic Computing Center, charged with the research and evaluation of the computer technology that is supporting the program, is conducting three separate projects:

CAI-Teletype  
CAI-1500 Instructional System  
Multi-Media Course Development

## CAI-TELETYPE

CAI-Teletype (CAI-TTY) was the first project in computer-assisted instruction at the Naval Academy. It uses the services of remote, time-shared computer terminals. The terminals in this case are standard ASR33 Teletypes that access a commercially owned computer via telephone lines. The Naval Academy is presently using a Burroughs 5500 system located in the Wash-

ington, D.C., area. The time-sharing system has 17 terminals; 10 of them are located in a specially designed classroom in the Engineering Department building, Isherwood Hall. The remaining seven are located throughout the academic departments, in faculty areas and classrooms. The facilities are now being expanded by the addition of 14 more terminals, 10 of which will be located in another classroom in the Michelson Hall Science Laboratory area.

The CAI-TTY experimental classroom has been used by selected faculty members in the presentation of their respective courses. To provide greater flexibility in the use of the terminals for the courses, the classroom is scheduled not only for the normal class day but also for the evening and weekends. This allows homework assignments that require remote-computer capabilities. The faculty participating in the project has been encouraged to exploit these remote terminals by developing learning programs that employ a variety of methods. The programs that are being used by midshipman students include problem solution, drill and review, data reduction, and system or model simulation. For the course in electrical circuits, for example, a series of programs has been developed to aid in teaching the effects of transients on linear circuits and a specific program, called SCOPE, teaches the basic operation of the cathode-ray oscilloscope. Wind-tunnel-laboratory exercises have been enriched by development of time-saving programs for data reduction and analysis. Simulations of aerodynamic, electrical, and mechanical systems, which permit the midshipman student to vary the parameters and observe the responses quickly, have added a new, dynamic dimension to the teaching/learning process. During academic year 1967-68, more than 200 midshipmen used the terminal in 11 different courses as a part of this project. During the present academic year, 1968-69, it is planned to give over 800 midshipmen experience with time-shared computer programs in some 18 courses.

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\*This article will appear in the summer issue of the Bureau of Naval Personnel Navy Training Bulletin.



## **CAI-1500 INSTRUCTIONAL SYSTEM**

This project is an evaluation of the use of on-line computer techniques in computer-programmed course content. The course materials are designed to be presented at a sophisticated remote terminal that incorporates computer-programmed image projection, audio, and a cathode-ray-tube display. The midshipman student can respond to the material presented by interacting with a keyboard linked to the cathode-ray-tube display or by using a light pen. The system is designed for self-paced or individualized instruction, and the student-response rate controls the amount of course material covered in each class period. Each time that the student responds to a question, his response is recorded for future analysis by his instructor. This analysis provides data on the rate at which the student is moving through the course materials, whether he is indeed learning the materials, and where the problem areas are. A compilation of student-response-rate analyses can be studied to determine adequacy of presentations, multianswer requirements, and branch paths desired.

The system selected to provide this type of sophisticated presentation was the IBM 1500 instructional system. It includes an IBM 1800 central processing unit that is capable of operating up to 32 time-shared student terminals. The course materials are authored by faculty members and are programmed by the technical support staff in the Coursewriter II language.

During its first year, the Naval Academy 1500 system had 12 student terminals. They are located in a specially designed CAI-1500 classroom. The expansion of this system to 24 student terminals by adding a second classroom is in process and will be completed in time for the spring term. Random-access audio terminals will be added as soon as they are available.

Before course materials can be developed for programming for computer-assisted instruction, a fundamental planning stage is necessary. This involves the preparation of a set of performance objectives (also called behavioral objectives) for the course being developed. After this has been defined, it is then the job of the author to prepare his materials, including media, to meet these objectives, with as many different approaches as are appropriate.

This year, the technical support staff developed student-response-analysis programs for the 1500 system, making it possible to provide a student-response matrix for the analysis of performance and the validity of these course materials. Another significant U.S. Naval Academy software development for the 1500 system is the capability for providing a course index and the ability to review material identified from it. So far, materials in five course areas have been developed: Chemistry, Modern Physics, Naval Operations Analysis, Introductory Russian, and Thermodynamics. The first term of this academic year saw 96 students log

over 860 student hours in these courses. It is planned to have over 250 students participate during the spring term.

Each of the five courses now on the 1500 system, however, uses a different strategy to accomplish the course objectives.

### **Modern Physics**

The 1500 system will be used extensively to present materials for this course. During the first semester of academic year 1968-69, the first half of the course was presented by CAI. The whole course should be ready for the midshipmen students during the spring semester. A tutorial-type strategy is being used in the teaching of basic principles and terminology during the first half of the course; the second half will be problem-oriented. Classes will meet for two class hours of CAI on the student terminal and for one class hour with the instructor. The latter period will be for testing and for resolving problems that the students have with the CAI materials.

### **Thermodynamics**

This course also depends heavily on the 1500 system. CAI was used to teach most of the first half-semester. The strategy is similar to that of Modern Physics, except that some effort has been made to have the computer evaluate the midshipmen's homework assignments and to give them remedial CAI materials where needed. Of special interest is a test/drill routine that uses graphics on the cathode-ray-tube display as a means of teaching the three-dimensional pressure/volume/temperature surfaces and regions. The student is to respond to questions about the surface and regions by choosing and pointing a light pen at a specified region. The system indicates if he is right or wrong; if he is wrong, the correct answer is blinked on the proper area on the cathode-ray-tube display. The materials are presented in short, concept-oriented CAI programs, each taking about 25 minutes. The midshipman will be able to concentrate on course materials that are giving him the most difficulty.

### **Russian**

The Naval Academy uses the audio-lingual approach to teaching languages. CAI is valuable in focusing attention on the principal structural problems of the language. The system also evaluates how well the midshipman has learned the concepts that he studies by text/instructor dialog in class and/or by audio tape. It also provides drill on concepts that the instructor feels need reinforcing. An interim CAI audio system employs a cassette recorder for a linear audio capability, which is a vital part of the course. The students meet with the instructor for classroom work two periods a week and spend the third classroom period at the CAI-1500 terminal. Each student is exposed to some 15 hours of CAI in this Russian course.



Figure 1. Naval Academy midshipmen working with the CAI-1500 Instructional System.



### Chemistry I

CAI is used to teach problem analysis in Chemistry. The problems are of the type that past teaching experience has shown to give the greatest amount of difficulty for the midshipmen students. For example, a rather complex problem is given, and, if a student can solve it, he is given additional problems on the same level for drill and review. If, however, he is unable to solve the problem, he is guided step by step through the functions necessary to reach the answer. In this course, which is given only during the fall term, the student meets for two class periods with the instructor and spends the third class period on the CAI-1500 terminal. Fifteen hours are spent by the student on the terminals during this course, as in the preceding one.

### Naval Operations Analysis

Assisting the midshipmen students in the application of the theory of operations analysis to practical problems is another use of CAI at the Academy. The instructor teaches the theory in the traditional way in two class periods each week and assigns homework problems. The midshipman will have his approach to these problems evaluated by the 1500 system during a third class meeting of the week. If he has difficulty with them, he will be scheduled for additional instruction on the system. He will spend about 12 hours at the CAI terminal in this course.

### MULTIMEDIA

In the third of its projects, the Naval Academy, in cooperation with the U.S. Office of Education, is directing the development of three one-semester college courses that will serve as models for a multimedia educational process. The development of these courses

will apply a systematic approach to instructional design, utilizing the latest educational techniques and technology. Much of the work of this project will be performed under contract to the Navy, monitored by the Academic Computing Center. The three courses and the contractors developing them are

Physics (Mechanics, Electricity, and Magnetism)  
—*New York Institute of Technology*

Economics—*Educational Technology Center of Sterling Institute*

Naval Leadership—*Westinghouse Learning Corporation*

These three courses represent a cross section of a college curriculum, ranging from “hard” to “soft” science. It is anticipated that an analysis of the approaches to the design of these three courses will permit identification of factors that are critical to generalization of the multimedia-course-development model. The underlying theme of this project is individualization. The courses will be structured so that each portion will be presented by those strategies and those media which meet optimally the student’s individual learning requirements.

### Objective of the Project

The primary objective of this project is the isolation and validation of a multimedia-course model that will be applicable to the development of courses both at the Naval Academy and throughout the educational community. The model will include designs for the following.

- Specification of course content
- Structuring of courses
- Selection of strategies and media
- Fabrication



- Implementation
- Validation
- Evaluation
- Course management

An immediate goal is the production of an optimized instructional system for the teaching of these three courses. The system will include not only instructional materials and instructional guides but also techniques for course management. The management system must provide for the following.

- Generation of reports for students and instructors
- Scheduling for students
- Control of pertinent resources
- Evaluation of student achievement
- Evaluation of course design and materials

### **Management Information System**

The necessity of devoting considerable thought to this management information system becomes apparent from an initial glance at the project's objectives. If these courses are to be tailored to individual student need (e.g., learning style, learning rate, career objectives, fields of interest, prior experiences), there will be many paths and many options for the student. Consequently, there must be an efficient means of guiding a student to the materials best suited to his needs as determined by an analysis of his background, his own goals, and his performance in the course.

Reports and analyses furnished to the instructor will be of the utmost importance. The instructor must be apprised promptly and frequently of the status of each student and of any personal attention that a student may require. In many instances, students who are performing either exceptionally well or exceptionally poorly will be directed to the instructor for special attention. Analysis of class performance will also be invaluable to the instructor for lecture planning. Finally, since no course content is static nor will a course ever be in a form that could not be improved, an instructor will require continuous evaluative information about effectiveness of course materials and design.

The evaluation design is a most critical aspect of this project, for only through such an information system can differences in students and student learning requirements be discovered and strategy established to meet these requirements best. From a practical viewpoint, it is necessary to establish criteria for judging effectiveness of media so that their cost effectiveness may be determined.

### **Multimedia Model**

Figure 2 illustrates the general model for the multimedia courses. The listing of media is not intended to be complete, nor does it reveal the tremendous variety of presentation techniques, strategies, or devices under consideration. In following the pattern of the model, a student would be scheduled for a portion of the course

in a medium that is most appropriate for him. The presentation could be either to an individual or to a group. The student progress can be monitored frequently, probably at least biweekly. On the basis of his performance in that course and his background data (including past record, interests, learning, style, etc.), he would be scheduled for the next course segment.

The dashed lines in the chart outline operations that the computer can accomplish with ease and speed—applications, which can be identified as computer mediation or computer management. Clearly, the computer has great potential as a management tool as well as an educational tool with which a student interacts directly during the learning process. The extent to which computers will be figured in the multimedia model is a most important question to be answered by the results of this project.

The role of the instructor in the multimedia course is certain to be different from his role in a conventional lecture course. Freed by the computer from the many routine and time-consuming functions, an instructor can devote his attention to student needs, course content, and course structure. The instructor will have a demanding and challenging role more akin to that of a tutor than a lecturer.

### **Development Schedule**

The project is being developed in three phases, each lasting approximately one year. The work to be performed in each phase is subdivided and organized as follows.

#### *Phase I*

- Specification of course objectives—definitions of general course goals, followed by specifications of terminal objectives and enabling objectives
- Sequencing of objectives—specification of instructional events
- Fabrication of learning materials
- Evaluation design
- Management design

#### *Phase II*

- Prevalidation tryout of course segments
- Course validation
- Revision of course materials and designs

#### *Phase III*

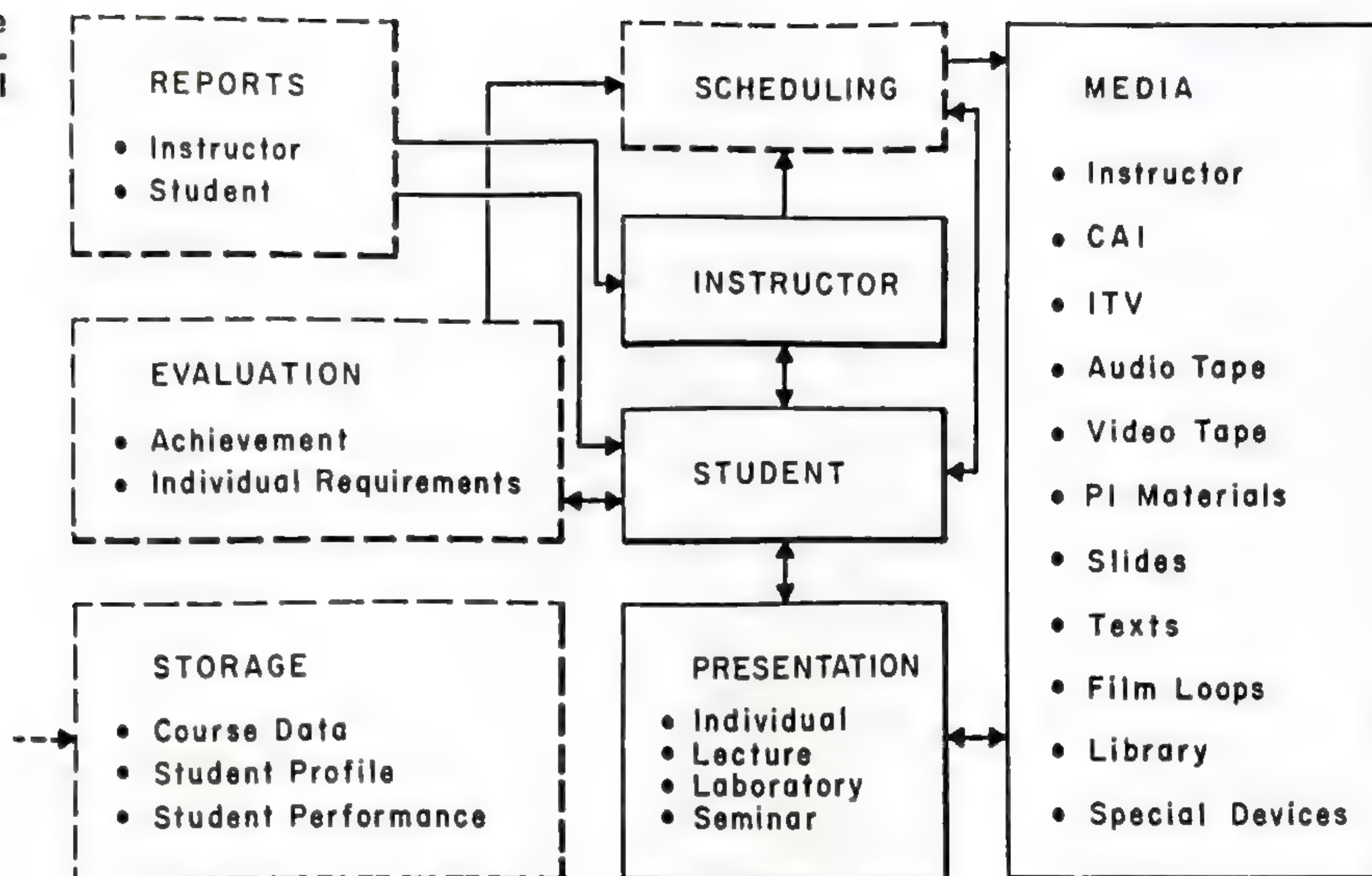
- Course evaluation
- Revision of course material and design
- Final report

Phase II for courses in Physics and Economics began in October of 1968. The course materials have been prepared and have undergone prevalidation tryout. The Physics and Economics courses will be conducted for validation during the spring term of this year.

The third course in the project, Naval Leadership, has been under development only a few months. Speci-



Figure 2. General model for the instructional process in multi-media courses at the U.S. Naval Academy.



fication of a leadership-course content, dealing more with intangibles than the other two, is exceedingly difficult and time-consuming. The schedule does not call for completion of course objectives and subsequent specification of strategies and medium for several more months. Consequently, it is not possible to describe at this time the details of the leadership course.

### SUMMARY

During the past two years, the Academic Computer Center at the Naval Academy was involved chiefly with

assembling a staff and developing course materials for its computer-assisted-instruction program. This year will be a period of validation of the course materials through extensive use to see if the courses accomplish their objectives. This coming July will mark the beginning of the evaluation phase, to determine the relative effectiveness of CAI in terms of content, time, and costs. The results of the program will be of concrete value not only to the U.S. Navy and the Academy but also to the entire university/college complex.

## NEW COPYRIGHT LEGISLATION INTRODUCED

A new bill, S.543, for the general revision of the copyright law was introduced on 22 January by Senator John J. McClellan, Chairman of the Subcommittee on Patents, Trademarks, and Copyrights of the Committee on the Judiciary. This version contains two titles: Title I is the general-revision portion and has the same wording as the unpassed S.597, which was introduced in 1967; Title II repeats the wording of S.2216, also unpassed, and deals with the establishment of a National Commission on New Technological Uses of Copyrighted Works.

The same text was used so that the subcommittee could carry on its consideration of copyright legislation from the point at which the adjournment of the 90th

Congress left it. The hearings were concluded during the last session of Congress, but Senator McClellan said in his introduction of the new bill that "Any comments or proposed amendments not previously communicated to the subcommittee, should be submitted at the earliest possible time."

EDUCOM representatives and Task Force members have taken an active role in the analysis of previously proposed revision legislation and made recommendations at the subcommittee hearings. EDUCOM's position on copyright changes was published in *EDUCOM* 2, No. 3 (Apr. 1967) in an article by law professors Benjamin Kaplan and Arthur Miller. The current bill, S.543, will be given careful scrutiny and its progress through the legislative process closely followed by EDUCOM in the interests of its members.



# networking notes

An experimental computer network linking five San Francisco Bay area schools with Stanford University's time-sharing computer, an IBM 360/67, is well on its way toward successful operation. The pilot network was set up late last summer under National Science Foundation sponsorship and links Mills College, San Francisco State, California State at Hayward, and the University of San Francisco, in addition to Gunn High School in Palo Alto, with Stanford's Computation Center. Each node communicates with the Computation Center via two typewriter terminals connected by leased telephone lines. The network is used largely by students taking instruction in computer science or in mathematics and the physical sciences.

A new teaching and research computer network will soon be available to all colleges and high schools in West Virginia. A new center will be constructed early this year to house the \$2.5 million IBM 360/75 that will be the core of the system. Schools and colleges participating in the program will get free computer time for teaching and for use of faculty members working on advanced degrees or on independent research. The only expense to network members will be for the terminals and facilities for data transmission on their campuses.

The new public television network has started beaming two hours of prime-time broadcasting five nights a week to about 150 stations throughout the country. The shows are produced by National Educational Television, a nonprofit organization. Until the network started, the video tapes had been mailed to subscribers and scheduled at the discretion of each station. The network is financed by operating grants totaling \$750 000 from the Ford Foundation and the federally financed Corporation for Public Broadcasting, and run by an 11-man group representing various parts of the ETV industry.

The Excerpta Medica Foundation, an international information network in the biomedical field, has recently installed at its headquarters in Amsterdam an NCR 315 RMC computer system for on-line use of the data banks. In addition, the Foundation is in the process of establishing regional centers throughout the United States so that its total information input can be processed by computer locally and made available to all U.S. medical scientists, medical institutions, and information centers.

## APRIL COUNCIL PROGRAM READY

Plans for EDUCOM's Spring Council, 15-16 April, have been completed and the program for the two-day meeting put into final form. Information for attendees and registration facilities will be available in the lobby of conference headquarters, the Harvest House Motor Hotel in Boulder, Colorado, commencing at 6:00 PM on Monday, 14 April. At 7:30 that evening EDUCOM President Jordan J. Baruch will host an open house for attendees.

Tuesday, 15 April, will be devoted to Technical Sessions covering computer applications to university administration. They will be held in the Horizon Room at the Harvest House. Session I, on Models and Simulation, will be chaired by Martin Greenberger, Chairman of the Council and Director of Information Processing at The Johns Hopkins University. His panelists will be John E. Keller (Director, Office of Analytical Studies, University of California, Berkeley), Daniel E. Bailey (Associate Professor, Department of Psychology, University of Colorado), and William Scevior (Institute for Policy Analysis, University of Toronto).

In the afternoon, Session II will be chaired by James G. Miller, EDUCOM Vice President and Principal Scientist, and Vice President for Academic Affairs of Cleveland State University. The discussion will be on Operations and the panelists will be Alexander Schure (President, New York Institute of Technology), Edward F. Staiano (Director, Freas-Rooke Computer Center, Bucknell University), and Britain J. Williams (Associate Director of the Computer Center, The University of Georgia).

On Wednesday, the entire day is scheduled for the Business Meeting of the Council, so that Institutional Representatives will have ample opportunity to discuss the panel sessions and EDUCOM's role in the applications of computer technology to university and college administration. (All attendees will be invited to the morning portion of the meeting to join in the discussion.)

At noon, a luncheon will be given in honor of Dr. Ward Darley, who helped to found EDUCOM and was a member of the original Board of Directors. Dr. Darley was recently elected the first Trustee Emeritus of EDUCOM.

Registration information can be obtained from EDUCOM headquarters in Boston. After 1 April, inquiries should be addressed to

Bureau of Continuation Education  
Conference Coordinator  
328 University Memorial Center  
University of Colorado  
Boulder, Colorado 80302



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### **EDUCOM BACK ISSUES ON MICROFICHE**

To facilitate the storage and accessibility of *EDUCOM*, Vols. 1, 2, and 3 (1966-1968) have been placed on microfiche. The fiche were prepared by Bell & Howell, using COSATI standards. Each volume occupies two of the 4×6-in. negatives and is packaged in a labeled envelope, with an identification strip visible at the top for easy retrieval. There are no restrictions on reproduction of pages or issues from the microfiche. *EDUCOM* on microfiche can be ordered from the Editorial Office at \$1 per volume. Please make checks or money orders payable to EDUCOM.

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## **Calendar of EDUCOM Meetings 1969-1970**

### **1969**

#### **COUNCIL**

15, 16 (17) April	Boulder, Colo.
13, 14 October	Notre Dame, Ind.

#### **BOARD OF TRUSTEES**

17 January	Boston, Mass.
14 March	Boston, Mass.
16 April	Boulder, Colo.
16 May	Boston, Mass.
5 September	Boston, Mass.
14 November	Boston, Mass.

### **1970**

#### **COUNCIL**

15, 16 (17) April
14, 15 (16) October

#### **BOARD OF TRUSTEES**

2 February	Boston, Mass.
14 April	Evening before Council
2 June	Boston, Mass.
10 September	Boston, Mass.
13 October	Evening before Council
10 December	Boston, Mass.



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# EDUCOM

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# EDUCOM BULLETIN

Vol. 4, No. 3

May 1969

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**On the Cover.** *Top left:* Ward Darley talks about the beginning of EDUCOM at the luncheon honoring his contributions. *Top right:* Participants in the Technical Sessions concentrate on the presentation. *Bottom:* Mountains around Boulder are reflected in the windows of one of the meeting rooms.

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# COMPUTER APPLICATIONS TO UNIVERSITY ADMINISTRATION

The Technical Sessions at the 1969 Spring Council of EDUCOM were devoted to presentations and discussion on the present and potential role of the computer in assisting administrative decision-making in institutions of higher education. The first one, on the morning of 15 April, dealt with models and simulation and was chaired by Martin Greenberger, Director of Information Processing, The Johns Hopkins University, and also Chairman of the Interuniversity Communications Council. Each of the three panelists is directly involved with the subject of models or simulation at a major university.

## COST-BENEFIT ANALYSIS

The first speaker was John E. Keller, Director, Office of Analytical Studies, University of California at Berkeley. He began by posing the question—What is unique about the management of universities? His answer—only the fact that universities have a unique set of objectives; otherwise they are faced with the same general problems as any large organization, and the main function of management is *resource allocation*. But how does one go about making the proper allocation decisions? By analysis of management information; and it follows that better analysis can only come about by better use, organization, and display of information. This, in turn stems from better data, data-gathering, and display. These data, however, must be relevant: computerized data are not valuable merely because they exist. The computer is useful in the context of a well-thought-out analysis and model. The analysis he was chiefly referring to, said Keller, was *cost-benefit analysis*. Its purpose is to “relate the cost and benefits of competing programs in a rigorous quantitative fashion so that choices can be made about preferred courses of action.” Very often a computerized model will be of substantial assistance; it has three advantages: use of the computer forces a deeper understanding of the interactions within the problem area because of the requirement to be “super explicit” in developing the program; models permit the evaluation of a wide range of alternatives and, where the interacting variables are numerous and complex, permit integration of them better than the human; and, finally, models form a hedge against the risk and uncertainty of a real-world situation.

The use of computers, of course, does not automatically give the decision maker an easier job; in fact, it might make his task more difficult because of his greater knowledge of the complexities of the problem and the extent of the consequences of his decision. However, this way of analysis and decision-making is preferable to the old “elegant amateurism” because universities have so much at stake and are so subject to public scrutiny.

The speaker then gave some examples of the use of models at his own university. The most useful one, Keller thought, is the overall cost-simulation model. The basic inputs are students by number, level, and discipline. The output is a prediction for any future year of what academic and nonacademic personnel would be required, the physical facilities (in square feet of space) required with their costs, and the operating budget in its usual categories. The model can be operated on “the basis of historical, empirically determined parameter values,” producing an “induced course-load matrix,” which enables the planner to make predictions about the course loads that will be induced *at all levels, in all fields by a student in a particular field at a particular level*. This feature, the speaker said, is the heart of the model and makes possible programmed budgeting.

## DATA BASE FOR UNIVERSITY ADMINISTRATION

The following speaker, Daniel E. Bailey, outlined a program for providing the higher levels of administration with a relatively complete data base. An Associate Professor with the Department of Psychology at the University of Colorado, he worked with the Office of Institutional Research at the University to develop a simulation system using available computer facilities. The project is now called CUSIM—the Colorado University Data and Simulation System. Its function is to provide a current picture of the educational and business status of the university, and thus to provide a basis for projections in both areas. It began as an *ad hoc* effort wrestling with the problem of how to describe the university—what it is and how it behaves. The first step was the collection of data from which models will be developed. With an anticipated annual





Speaker D. E. Bailey with Chairman Greenberger.

enrollment of 25 000, the university can store, through use of the computer, on one 2400-foot reel of magnetic tape six years of data for all of the enrollments. Another tape handles all of the course-catalog and budget requirements for the same period.

Various other useful files are extracted from the base. For example, a semester-summary file contains matrices: Matrix A is a categorization of students at levels by sex, residency, type, and academic major; Matrix B is a duplication of A for each course. These are linked to a catalog file that contains lists of information describing the structure of the university and the properties of the structure. These are a course catalog, a space catalog (information about rooms), an Instruction, Research, Administrative and Service unit catalog, and a faculty catalog. There is also a student file, in the process of development, that will enable the administration to trace the course of each student throughout his university career.

An objective of CUSIM is a degree of interaction that will permit administrative officials to draw information from the files through an office cathode-ray-tube terminal and light pen. Another ongoing use of CUSIM is in actuarial studies, some of which are already developed and in planning use. These are statistical analyses of file-stored data, such as: enrollment patterns, drawn from Matrices A and B; space use, by size, type, and location; class size and teaching loads by department; and costs broken down into major academic fields. In progress, said Bailey, are some persistence studies, which show the degree to which students change majors at various levels and the effect of this pattern on the overall cost of getting the student through.

Other studies in simulation and projection are under way. An important one of these was to develop feedback from faculty and students both. Faculty often handle their curricula and budgets differently than the planners anticipated, and these factors must be worked into the system to allow valid projections. This is really a problem in *data-source management*. He ended by stating that in this context the university could be viewed as a data generator and the object of the system is to capture the data and make them fully available in useful form.

#### SIMULATION MODELS FOR PLANNING

In introducing the next speaker, the Chairman pointed out that both of the previous panelists had mentioned the pioneering research done by Richard Judy of the Institute of Policy Analysis at the University of Toronto, and that it was especially appropriate to have an associate of his on the program. William Sceviour is a Senior Systems Analyst in the Systems Research Group there and is working on the development of the CAMPUS IV systems simulation model. He said that, as he was following a philosopher and a psychologist, he would assume the role of historian and review the growth of CAMPUS—Comprehensive Analytical Methods for Planning in the University System. It is an attempt to bring management tools to the university administrator and was begun in 1964 with a request from the Commission on Financing Higher Education in Canada to Professor R. W. Judy to build an econometric model to analyze cost data. Judy, with J. B. Levine, offered a counterproposal to build and develop a cost-simulation model. This was done in 1965 and was followed by a plan to implement the pilot program at the University of Toronto. This later effort, CAMPUS II, was programmed for the IBM 7094-II computer.

The CAMPUS models simulate university operations over a time period of any length. By accepting descriptions of university structure, program statements, detailed specifications, and planning factors, a digital computer can then compute resource requirements. Among the several developed are ones for undergraduate education, specialty training, medical-staff requirements (for the two previous models), patient-record information, and patient and teaching bed requirements.

A new research program, including extension of the CAMPUS concept, has been started by the Institute of Policy Analysis, Sceviour said. This is funded by the Ford Foundation and some of its elements are to determine the objectives of higher-educational systems and methods for success measurement and feedback. It also includes further development of CAMPUS-type models. One of these is CAMPUS-III, which is being programmed for FORTRAN IV on the IBM System 360/65. This should be suitable for analyzing management questions from highly detailed levels of academic programs to the macrolevel of the entire university. One



use of this will be to produce a management game for university administrators, which will teach them how to solve problems of resource allocation as they develop familiarity with the computer-based tools.

CAMPUS IV is a less complicated version of III, and is designed as a model for smaller institutions of up to 20 departments, 25 programs, and 500 activities. To facilitate interaction of the users, a COMMAND concept is employed. The five *level commands* are: INPUT—read input data and parameters; SIMULATE—calculate resource requirements; EXPERIMENT—adjust the data parameters; OUTPUT—specify the report procedure; and FINISH—end the processing. Under INPUT there are level 2 commands, which localize the read instructions in the subroutine; then level 3 commands come into play to indicate to the subroutine exactly which read instruction and format statements are used to read in the data involved. This approach is designed to make the model easy to use by the administrator.

### OPERATING ADMINISTRATIVE-AID SYSTEMS

The second Technical Session was chaired by James G. Miller, Vice President for Academic Affairs, Cleveland State University, and Vice President and Principal Scientist of EDUCOM. In his introductory remarks, he stated that he was impressed, during visits to various universities, with the difference in the level of sophistication among them about computer applications to the administrative process. Even large ones have a low degree of sophistication, and, if this is true, then how can small ones be expected to be able to take advantage of modern technology? It has been said that universities are out of management control, Miller continued; while this may not yet be true, nonetheless, administrators must face up to the fact that techniques such as cost analysis and measures of effectiveness (discussed in the morning program) are essential if control is to be retained. Faculty, for example, are engaged in a form of group practice and should be willing to



William Sceviour addressing the Council.

account for the way they spend their time. If these things are not done, the university system faces a kind of "granular disassociation." One of the functions of EDUCOM is to facilitate communications about the uses of technology in preventing this, even though it may mean constant repetition of basic information disseminated in a variety of forms. Not only must the administrators and computer center directors understand the administrative-aid systems, but also the faculty, staff, and students who will be affected by their use. We must develop alternate modes of educating, doing research, and managing our institutions.

Pointing out that the present program was an outgrowth of the morning session in that it was a step from the discussions of theory to a consideration of practical solutions to portions of the problems involved, Miller said that the three panelists would each present a case history of how a specific institution had developed a method of establishing an information system to be used for management decisions.

### COMPUTER-BASED EDUCATIONAL MANAGEMENT DESIGN

The leadoff speaker for Session II was Ernest J. O'Dierno, Director of Advanced Systems of the New York Institute of Technology. His research team is totally committed to the development of management information systems relevant to the educational sector. An example of such a system, the speaker said, is ULTRA, an educational-guidance simulation model that is capable of evaluating, feeding back information, and directing the student through a complex educational environment. A major subsystem is called IMIS and is designed to handle routine management functions such as scheduling, resource allocation, payroll, and the like. The systems operate in both academic administration and financial administration. The latter two functions are already a part of every institution; in the area of new evaluative functions requiring more complex tools, the New York Institute of Technology has been using the method of exploring existing technologies and from them creating adaptive mechanisms that will provide data foundations from which the models and simulators can be constructed. (It is here that aspects of the work done at Toronto and at Berkeley have been considered.) To achieve this, an information retrieval and handling system has been developed upon which all the other systems are based. The orientation has been to open-end, sequential access files. This is to avoid the necessity for redesigning the system at, say, 15 years in the future when the amount of information will have grown beyond present estimates.

This system, SAFES, already exists at the Institute and is in use in the context of a time-shared teleprocessed environment. It has been tested in use in connection with Project MAC and at the U.S. Naval Academy.





O'Dierno went on to describe some of the other subsystems operating with SAFES. In addition to ULTRA and IMIS, there is AIMS, which is an automated management instruction system, and PROMIS, a subsystem for educational planning and evaluation. The system receives input such as student performance and produces a variety of statistical reports. One of the objectives is the monitoring of student progress in order to determine what type of course presentation or teaching strategy might best suit that individual. This includes a student diagnostic test battery, a predictive capability, validation of tests and examinations that the student takes, and a comparison with the performance of the class as a whole.

The feedback capability of the SAFES subsystem provides the means, through a generalized decision, for modifying the total system to reflect evaluation of its performance. Overall, the data base is designed to provide a mechanism not only for receiving additive input for itself, but also for making that input available in proper form for use and analysis by other subsystems. And each of the operating routines is modularized so that it becomes an input device to the data base.

A third area of administrative effort is Planning and Development, and it draws its data from the financial and academic administrative areas.

The speaker then illustrated the use of a subroutine, in the instructional area, that evaluated students on the basis of multimedia instructions in order to determine if they were *media-sensitive*—that is, better adapted to a particular type of instructional medium. Further, a discriminate analysis can be run that, when added to a body of such analyses, makes it possible to predict the performance of students of similar backgrounds.

## AN APPROACH TO STUDENT-RECORD SYSTEMS

The second case study was presented by Edward F. Staiano, Director of the Freas-Rooke Computer Center at Bucknell University. (In the preparation of his paper, he was assisted by A. Frederick Seaman, Senior Programmer at the Center.) The problem under attack was the establishment of a student-record system at a university with a student body of 2500. This implies rather strict selectivity and a concurrent efficient admissions system. Also, a university of this size depends more than usual on its alumni, and this means keeping track of the student not only while he is in the learning

program but, virtually, for his lifetime.

Previously, the speaker said, a unit record (first-generation) system had been in use, as is the case with most institutions. About four years ago, a second-generation or batch-processing system was started. Its concern was with admissions, active student records, and the alumni. Each part was developed individually and no attempt was made to link them. Coincident with the installation of an SDS Sigma-7 computer, plans were formulated for a third-generation system in which the three areas of concern could interface. This is in the design stage. [*Ed. note.* Although the presently operating system was also described, the limited space here will be used to summarize the third-generation one.]

Data are initially collected and assembled in the admissions system. Those on accepted students are passed on to the alumni system. Eventually, the system can become a closed loop if data on alumni children are fed into it. Connecting these components will be a processing mechanism for evaluation and for feedback to the admissions office.

Storage in the admissions component is principally random access and about 256 characters per record (person). Card input will be eliminated and information generated external to the campus will be supplied on magnetic tape. The admissions files will be put on line during the day and made available to the admissions office for entering and updating. Information on admitted students will be passed on to the active student system, which is also random-store oriented with an average of 4096 characters per record. These records will be in "page" form, so that the graduate student will have more characters than the freshman. Much information will be transferred to magnetic tape for storage. An edited record will be passed to the alumni system.

The alumni system, Staiano said, is also random storage with about 512 characters per record. It will be on line during the day so that clerical staff in the alumni office can use and update the records.

The goal of the coordinated system is to provide better information for management decisions. It should also free operating personnel from menial tasks in manual record keeping.

## THE RESEARCH COMPUTER CENTER

The final panelist was Britain J. Williams, Associate Director of the Computer Center at The University of

*continued on page 9*



# ROLE OF EDUCOM DISCUSSED

The official meeting of the Interuniversity Communications Council was called to order at 9:20 AM by the Chairman, Martin Greenberger, Director of Information Processing, The Johns Hopkins University. The morning session was given over to a discussion of the Technical Sessions held on the previous day. Two commentators representing the university administrator's viewpoint opened the program: Thurston Manning, Vice President for Academic Affairs, University of Colorado; and Edison Montgomery, Vice Chancellor, Finance, University of Pittsburgh.

In his introduction, the Chairman stated that the basic question to be answered concerned the determination of the best way to proceed in the application of computer technology to administration; what is the best way for universities to act together in this area and what role can EDUCOM play?

## THURSTON MANNING

The first commentator began with a rephrasing of the problem; he asked, should EDUCOM be an organization of experts or should it have a missionary role? The talks during the Technical Sessions had the characteristics of an organization of experts, with the symptoms of professional jargon, acronyms, and a tendency to think more in terms of systems than of the people who would be operating them. More effective communication must be established between the experts and the administrators who will be applying the results of their efforts. It must always be kept in mind that the end is not manipulation of the system itself but the effectiveness of the system as a useful tool.

Another basic and difficult question, Manning said, was the determination of measures of effectiveness in educational activities. Some measures discussed in the Technical Sessions seemed to be: more money spent by the computing center; more administrative time spent per document; the increase in data supplied to the administrators; and, in one instance, fewer people working. Thus it is still not clear what is meant by "measure of effectiveness." How does the administrator at the high university level measure the effectiveness of a system? This is a problem to which the technical area must address itself. To return to the role EDUCOM should play, the question then becomes: can the organization address itself to the basic and difficult questions which are of importance to those outside the technical area?

## EDISON MONTGOMERY

The commentator stated that he wanted to give a personal perspective of what had been presented during the Technical Sessions as an approach to examining the question of what role EDUCOM could play in assisting the individual administrator. The University of Pittsburgh is a large institution with about 27 000 students, in an urban environment, and with some experience in financial crises. It is involved in the development of a computerized management information system, which will cost the equivalent of a major academic department. It must be always borne in mind, however, that academic administration should be a facilitating mechanism for the academic process, rather than a kind of production management operation.

In expressing some concern with the emphasis on cost-benefit analysis, Montgomery said that as a budgeteer he did want to have more information about costs but was not certain of the value of "quantifying benefits." At Pittsburgh, for example, there is much research and community service, which makes the cost analysis of the teaching process quite incomplete.

It must also be borne in mind that the revolution in higher education is very likely to change or remove many of the quantifiable items, such as numbers of credits, formal scheduling, which are now factors in information systems. As far as EDUCOM's role is concerned, it could act to determine cost benefits of sophisticated management systems for the information of its members through a series of studies. Also, EDUCOM might initiate a project to identify common elements in college and university administration for the benefit of its members. Another role EDUCOM might play is in the design of highly generalized systems that can be adapted to the needs of the individual institution; in this respect it would be a clearing house for the detailed systems that already have been developed by members and portions of which might be of value to others. It is possible also, that the Educational Information Network (EIN) could be used for specialized data-processing of parts of systems. One member might perform a given function for another member or a group of members with a common method of operation. In the final analysis, in these changing times, the best computer for university administration is still the human brain, and that brain should get the best information that the institution can afford to collect.



To summarize, EDUCOM's role should be in the sharing of information and resources, not only for administration, but for the intellectual, academic, and instructional functions of its members; it can also work for the acceptance of new technologies in education in the hopes that use of these will enable universities to increase their productivity. The missionary role expressed by the previous commentator can be filled in the generalized sharing of intellectual resources.

#### JOHN MINTER, WICHE

Chairman Greenberger then introduced John Minter, Western Interstate Commission for Higher Education, whose organization is conducting a project involving a number of representative state universities interested in the development of administrative educational systems. Minter described WICHE as a compact of 13 western states interested in sharing comparable data about the cost of instruction. Major institutions were involved because they are the ones who generate data and who will be affected by policy decisions made from those data. A triumvirate of political, educational, and economic factors is involved in this data-sharing concept. Objectives of the project are the development of standard compatible data sets and assistance at the local decision-making level. Policy decisions are to be made by the educational user. The project is funded by the Office of Education. Within a short time, the project is expected to issue a draft of a student data glossary and following that will be a standard data element glossary with reference to staff.

The purpose of the data bases, and of the information systems which they will serve, is to improve the capability of local institutions to allocate more effectively resources and to provide to the cooperating organizations comparable data from throughout the region by level of student, level of course, and field of study. The project is in its first phase and will be going into its second phase over the next three years.

#### DISCUSSION

A speaker from the floor stated that his university used simulation, not to explore the organization of the university, but to explore ways of managing performance criteria oriented to instruction and to the students themselves. Montgomery replied that his own skepticism about simulation as applied to university administration lay in the fact that the things planned for, such as buildings, would probably be serving a different function in a few years than that for which they were originally designed. Jordan J. Baruch, EDUCOM President, then addressed the question posed by the first panelist about EDUCOM's role. Of the kinds of missionary activity that have traditionally been launched, the President said, EDUCOM should use that which is oriented to service. An immediate task of EDUCOM, however, is to find out what common problems are, and to what particular group those prob-

lems apply—administrators, teachers, students, etc. When this is known, then EDUCOM can intelligently address questions of the application of financial or intellectual resources to solutions.

Another attendee stated that a very important point that had been mentioned was the problem of communication between the expert and the administrator. The measures of effectiveness discussed previously are generally those imposed on the technical expert by the administrator. Such measures might be applied in different ways, and more communication is necessary to come to common definitions. Ward Darley offered the opinion that EDUCOM could aid in this problem, not only by stimulating discussions of the kind going on at that moment but also by facilitating research in measuring the effectiveness of teaching and learning; and this goes back to the question of faculty involvement. It poses the question of how EDUCOM can help universities to reach into their faculties and encourage them to use new communication techniques for the improvement of teaching and learning effectiveness and also free themselves for more active interface with the students. Therefore, in answering the question, it would seem that EDUCOM does have a missionary purpose.

EDUCOM Vice President Miller expressed the opinion that EDUCOM should continue to concern itself with specific applications to problems, but at the same time to keep current with basic research that might have relevance to the specific problem areas. Concern with simulation, for example, would be such an area. For those involved in decision-making, it is extremely helpful to have this type of information. The information that is collected, however, must be used only for the specific purpose for which it was intended, and that involves security of the information. The ethics of handling information is a critical component of management.

A speaker from the floor stated that he understood EDUCOM's role to be essentially one of technology transfer. This differs from the role of creating technology. For example, rather than cost-benefit analysis, it might be better to start with the university cost-accounting systems. This is a staff function, and EDUCOM might serve to transfer information that would enable this function to be better handled. Further discussion elicited the comment that much of the talk had been about the management of information, and not about information for management. EDUCOM's role might concentrate on the former, leaving the latter to professional groups. The EIN program is a step in this direction.

The session closed with a final statement by Board of Trustees Chairman Hunter that the discussion of EDUCOM's role could not be disassociated from the present crisis, not only in education but in an overall value system. The point must be made that the "prosthetic device," which is the computer, must not be allowed to depersonalize the real, human value judgment.



## WARD DARLEY CITED

Dr. Ward Darley, Trustee Emeritus and a founder of EDUCOM, was honored by the membership during the Spring Council at Boulder, Colorado. Dr. and Mrs. Darley were the guests of honor at a luncheon on 16 April. Dr. James G. Miller, Vice President of EDUCOM and the first Executive Secretary of the new consortium, spoke to the Institutional Representatives and guests about Dr. Darley's contributions and presented him with an engraved silver tray and an engrossed citation. The latter, a resolution of the Board of Trustees, read:

Whereas Ward Darley has played an active and vital role in the conception, formation, and funding of EDUCOM, and

Whereas Ward Darley has served as a member of the first Board of Directors, as a member of the Board of Trustees, and is the first Trustee Emeritus of EDUCOM, and

Whereas he has been a source of inspiration, guidance, encouragement and leadership in the development of EDUCOM and the refinement of its goals, and

Whereas his knowledge, scholarship and professional skill and integrity have justly earned him the enduring respect and affection of the Members of EDUCOM, therefore be it

Resolved that the Board of Trustees, on behalf of the Members, expresses its sincere gratitude to Ward Darley for all of his contributions, and presents him with this citation as a permanent record of its appreciation.

Dr. Darley is presently Executive Vice President of the National Intern Matching Program and a Visiting Professor of Medicine at the University of Colorado School of Medicine. He holds an M.D. from Colorado and has been awarded honorary degrees by many other universities. He is a former President of the University of Colorado and has been Executive Director of the Association of American Medical Colleges. He is the author of over 130 papers in professional journals and holds membership in many scientific and medical societies. He will continue to act in an advisory role to the EDUCOM Board of Trustees.



James G. Miller standing between Dr. and Mrs. Ward Darley at the luncheon in their honor.



# EIN TECH REPS MEET

Prior to the Spring Council, the Educational Information Network (EIN) Technical Representatives met at Boulder to review the report of the Steering Committee. The report set forth guidelines for the operation of EIN, recommended the election of an Executive Committee of six members, and further recommended that programs entered in the *EIN Catalog* be reviewed by qualified people before publication. The Tech Reps present adopted the report, and the Steering Committee was then dissolved.

An Executive Committee of EIN was elected, with Thomas Keenan, Executive Director, EIN, as *ex officio* member and Chairman. Other members are:

Daniel Bernitt	The Pennsylvania State University
Lorraine Borman	Northwestern University
Demos Eitzer	The City University of New York
Thomas E. Hulbert	Northeastern University
E. P. Miles, Jr.	The Florida State University
Edward F. Staiano	Bucknell University

The Chairman reviewed the EIN publications program to date. An *EIN Newsletter* has been started, and a preliminary version of a *Directory of Information*

*Networks and Network Activities* prepared. An *EIN Program Mix*, listing the programs submitted by participating universities, has been published for participants in EIN, along with a draft version of a *Documentation Standards Handbook*. The latter defined the form of a catalog entry for the *EIN Catalog* and offered a model. The Tech Reps accepted the format, with some modifications, as a working model for the initial effort. Work is now in progress on the *EIN Catalog*; it will have four basic sections:

- Description of Participating Facilities;
- Index of Programs;
- Functional Abstracts;
- Catalog Entries.

In addition, backup documentation, consisting of all of the technical description of a program and its operating environment that has been collected, will be available on request for a reasonable cost.

Further information can be obtained from

Dr. T. A. Keenan  
EDUCOM  
9650 Rockville Pike  
Bethesda, Maryland 20114



EIN Tech Reps consider the Steering Committee report.



## FIVE MEMBERS ADDED

At the Business Meeting of the Spring Council, five new members were added to EDUCOM, bringing the total membership to 102. They are described below.

**The Catholic University of America**, located on 127 acres in Washington, D.C., is a private coeducational university controlled and governed by the Sacred Congregation of Seminaries and Universities of the Holy See. It was chartered by Pope Leo XIII in 1887. Five schools and colleges offer undergraduate curricula in Arts and Sciences, Philosophy, Architecture, Engineering, Music, and Nursing. Graduate programs are offered in most schools. The University has an enrollment of nearly 7000 students, with a teaching staff totaling 671. Acting president of the University is Brother Nivard Scheel.

**Macalester College** is a coeducational institution in St. Paul, Minnesota, situated on a site comprising 27 acres. The college was incorporated in 1853 as Baldwin Academy. A broad range of Liberal Arts programs leading to the Bachelor of Arts degree is offered by the College. It has an enrollment of nearly 2000 undergraduates, with a teaching staff of 141. President of the College is Arthur S. Fleming.

**The Medical College of Ohio at Toledo** was created by the General Assembly of the State of Ohio in December of 1964. The first class will be admitted in the fall of 1969. The College will enroll 30–35 students for several years until construction of the permanent campus is completed on a 346-acre tract. The Medical College is cooperating with the Lucas County Academy of Medicine in the development of continuing-education programs for approximately 1400 practicing physicians, with support from the Public Health Service.

**Southern Methodist University** of Dallas, Texas, was chartered in 1911 as a coeducational institution under private control. The University has the semester system and its various schools and colleges include: Arts and Sciences, Law, Perkins School of Theology, Music, Engineering, and Business Administration. The University has an enrollment of nearly 6000 students taught by a faculty of 445. A Master's is offered in all departments and a Doctorate in most. President of the University is Dr. Willis M. Tate.

**The University of Utah**, situated on 639 acres of land in Salt Lake City, was chartered as a coeducational institution in 1850. Its colleges include: Letters and Science, Business, Education, Engineering, Fine Arts, Mines and Mineral Industries, Nursing, Pharmacy, Law, and Medicine. Graduate programs are offered through most departments. The University enrolls nearly 18 000 students. Its faculty numbers about 1500. President of the University is James C. Fletcher.

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*continued from page 4*

Georgia. He pointed out that Georgia, like many large universities, had two computer centers—one for administration and the other for research and education. The latter, however, does do some work that is pertinent to the administrative/management area; for example, there is an alumni program that enables the office to maintain current contribution files, addresses, deaths, and the like. This data base is held on magnetic tape and uses a second-generation 1401 computer. Plans are to make it third generation and have it on line.

Another ongoing program, Williams said, is the COSMIC library. Under government contract, a library of computer programs is maintained and made available for a fee to organizations outside the university. A third type of information retrieval involves using a data base of abstracts from certain disciplines and making them available in various forms to users.

The speaker concluded with a list of "danger signals" for administrators who might be in the position of having to make decisions about the acquisition of computers and the implementation of systems: First, documentation—in large systems, this must be settled early in the design phase; second, implementation—are the systems designers going to be the implementers or will there be turn-over problems; third, time—will the system be usable in a reasonable length of time; fourth, hardware—is there sufficient to allow for growth; fifth, method of use—where will the bulk of the information be stored—at terminals or in the main computer, and how will access be controlled; sixth, security—can terminal users be controlled in the extent of their interrogation and control of the system.



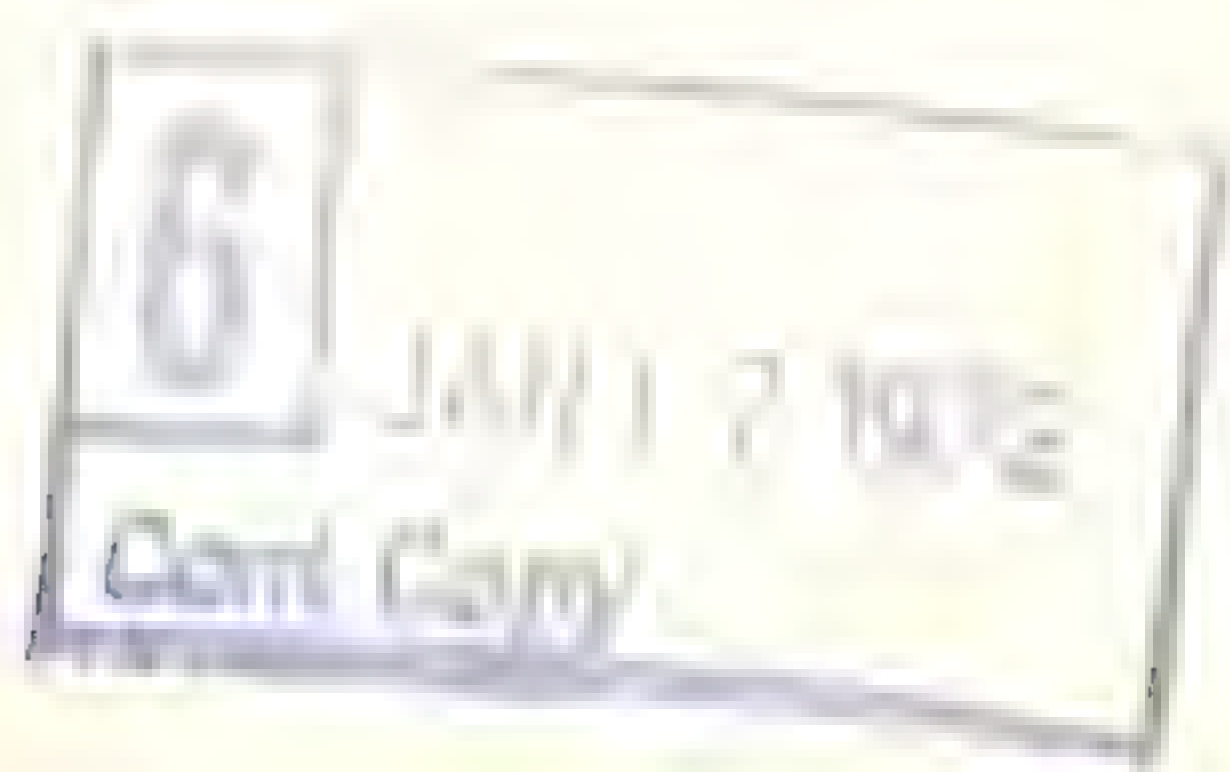
**1969 FALL COUNCIL  
AT NOTRE DAME**

The EDUCOM Fall Council for 1969 will be held on 13 and 14 October in the Center for Continuing Education at the University of Notre Dame. Overnight accommodations have been arranged at the Morris Inn and the Holiday Inn. Flights to and from South Bend, Indiana, connect with major cities.

EDUCOM, 100 CHARLES RIVER PLAZA, BOSTON, MASS. 02114







September 1969

Volume 4 Number 4

# EDUCOM

Bulletin of the Interuniversity Communications Council (EDUCOM)





# EDUCOM BULLETIN

Vol. 4, No. 4

September 1969

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**On the Cover.** Panel chairmen make their reports to participants at the Plenary Session of the EDUCOM/University of New Hampshire Symposium on the Computer Utility—Implications for Higher Education, held in May at Manchester, New Hampshire.

**Photo Credits.** Rogier Gregoire, EDUCOM.

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# MAY SYMPOSIUM RECOMMENDATIONS SUMMARIZED

One immediate value of EDUCOM's May Symposium, "The Computer Utility—Implications for Higher Education," was a realization that the higher education community needs a greater degree of interaction with private firms and organizations and with public agencies dealing with communications and computer application. The conference, held in Manchester, New Hampshire, in conjunction with the National Science Foundation and the Whitmore School of Business and Economics of the University of New Hampshire, came about as an indirect result of the recent inquiry by the Federal Communications Commission concerning regulatory and policy problems caused by the interdependence of computer and communication services and facilities. [EDUCOM 4, No. 1, 5-6 (Feb. 1969.)]

The three-day meeting was organized into four panel sessions, followed by the workshop session of panelists and participants in each of the four subject areas and climaxed by a plenary session in which the session chairmen summarized the discussion and recommendations at each workshop session and heard further, general comments from the attendees. In the summary that follows, speakers in each subject area and their topics are listed, and the recommendations of the chairmen given at the plenary session are briefly noted. A preliminary overview of the discussions at the plenary session is extracted from the paper drafted by Professor Manley Irwin, Whitmore School of Business and Economics.

## IMPLICATIONS FOR INFORMATION SCIENCE

Chairman John F. Lubin, Director of Computing Activities, University of Pennsylvania, led off the technical sessions. His first speaker was Richard Mills, Director of Information Processing Services, Massachusetts Institute of Technology. His topic, on-line computation in education, discussed the work at MIT with a model computer-utility network, which is envisioned as an interconnected set of highly developed nodes. He was followed by Edgar L. Eichhorn, Manager, Advanced Planning and Research Systems, Jet Propulsion Laboratory, who spoke on real-time computations. Malcolm Jones, Assistant Director, Project MAC, talked on simulation, which he described as a technique for helping to understand complex problems and one which is especially adaptable to the Multiple Access Computer, which, in turn, forms the basis for the computer utility. J. C. R. Licklider addressed the session on the subject of computer graphics, within the context of higher education. An additional speaker, whose presentation was given later in the Symposium, was Nelson Logan of the Department of Computing Sciences, University of Utah. He described the work going on at Utah in computer graphics.

The Chairman, in his summary at the plenary session, commented that his workshop group felt that education was facing two stages of development of the

computer utility; the first is one of local utilities associated with universities and the problem will be intercommunication; the second stage will arrive as utilities grow to regional and to national size. In facing these stages, it will be increasingly important for higher education to have a voice in and an influence on the way in which this technology develops. Dr. Lubin's group recommended the establishment of an agency in the Federal Communications Commission to advise on computer communications. It would have both representatives of the university and of the common carriers along with the function of relating the special needs of education to existing regulations. It was also a recommendation that the educational community develop ways of making its needs known to the computer manufacturers and to professional associations concerned with computers. It was pointed out by one of the participants that college and university computer centers will not just be individual consumers but will form a body of users with a reasonably common voice.

## IMPLICATIONS FOR DATA BANKS

Chairman Arthur Miller, Professor of Law at The University of Michigan Law School, led the discussion about data banks. His first speaker, Donald A. Lindberg, is Director, Medical Center Computer Program, University of Missouri. The subject of Dr. Lindberg's



talk was life sciences and medicine. Next, Franz Alt, the Deputy Director, Information Division, American Institute of Physics, discussed material from his subject area—physical sciences and engineering. Mr. Alt emphasized that time-sharing interactive computing may be the clue to data-center automation. Following, and speaking last, was William Godwin, Developmental Research Division, Educational Testing Service. In his topic, academic data banks, Mr. Godwin stressed two major difficulties that accompany the educational trends of the future: student progress will be difficult to monitor, and the choice of an adequate study will be difficult to make.

Professor Miller prefaced his report to the plenary session with the statement that his panel had taken as a point of departure the fact that some data banks of hard numeric material, such as credit information, exist, although academic data banks are not yet available in future computerized form. It is a very real problem to design data banks in areas such as the social sciences, where the information is not static subject to value judgment. The panel agreed that, within the context of the computer utility, the weakest link was transmission of data. Forms of this weakness are high cost and the difficulties of user interaction with the carriers.

Another recognizable problem is that the digital data today are being transmitted over a voice communication system which was not designed to support it.

The panel's recommendations were for a study and reconsideration of the whole pricing structure, including tariffs, of transmitting digital data and for a parallel study of switching and other transmission problems with a view toward the establishment of an entirely separate transmission network for data communications. Satellite transmission possibilities, from data bank to data bank or to user, should be exploited, and perhaps a domestic satellite design which would interface with both data, voice, and picture transmitters. The panel also felt that it was time for a significant experiment with the concept of a national data bank. A poison-control data center was suggested as a vehicle for the experiment. At the same time, adequate consideration has to be given to the question of privacy with regards to the data in such a bank.

## **IMPLICATIONS FOR LIBRARIES AND INFORMATION SERVICES**

The chairman of the third session, and of the workshop following, was Melvin McFarland of the Division of Information Systems, Library of Congress. He introduced Fred Tate, Assistant Director, Chemical Abstracts Service, who discussed disciplinary libraries. Mr. Tate felt that the computer utility should serve the full range of industry, government, and academia and implied the possibility of direct-dial access not only to disciplinary information but to interdisciplinary as well. The next speaker was Harvey Marron, Chief, Educa-

tional Resources Information Center (ERIC), whose topic was the impact of the computer utility on the practice library. He pointed out that the difference between a computer-service bureau and a computer utility lies in the fact that the latter provides services in the environment of the user. He suggested that we already have several information utilities in operation—for example, at the Atomic Energy Commission, NASA, NLM, and so on. He was followed by Ronald Miller, Coordinator of Library Systems, Five Associated University Libraries, who pointed out that there is a trend now for university libraries to join together in consortia or other associations. They are still thinking in terms of networks, and a computer-utility concept is a way of serving network needs. The final speaker of the group was Lawrence Livingstone, Lister Hill National Center for Biomedical Communications. He pointed out that the national libraries had turned to electronics to help solve their problems, and to automation, and then to the network concept for interrelation. Before the computer utility could be effective for national libraries, federal regulatory legislation would have to be studied and modified.

At the plenary session, Chairman McFarland gave the conclusions reached by his panel. He began with a specific definition of a computer utility based on one offered by Douglas Parkhill in his book, *The Challenge of the Computer Utility*. As generally envisaged, he said, a computer utility is a general-purpose public system simultaneously making available to a multitude of diverse, geographically distributed users a wide range of different information-processing services and capabilities in the environment of the user. The needs of libraries and information services require that the computer utility shall have large open-ended capacity to store text; the ability to guarantee the integrity of the stored material; the ability to meet the needs of different classes of users. In considering regulation, this panel felt that the Communications Act of 1934 needed revision. And there was concurrence with previous recommendations that a voice or forum for the educational community with respect to the computer utility was needed. He proposed that the National Commission on Libraries and Information Science (for which legislation is pending), when established, be asked to act in this capacity.

## **IMPLICATIONS FOR INSTRUCTION AND TESTING**

Thomas E. Kurtz, Director, Kiewit Computation Center, Dartmouth College, chaired the fourth session. His first speaker was William Harless, Chief of Instructional Systems, College of Medicine, University of Illinois. Under the topic of professional continuing education, he stated the concern over professional obsolescence and resultant need for more effective means of providing required materials for practitioners



to use. With respect to the computer utility, the issue for education lies in the determination of what kind of information should be stored and made available to serve specific educational objectives. He was followed by Robert Linn, Developmental Research Division, Educational Testing Service, who stated that computer-assisted testing is a natural extension of expanded use of computer-assisted instruction. Large-scale testing, using systems flexibility, will follow on the growth of the latter. Next, Roger Johnson, Education Research Laboratory, University of Illinois, talked on computer-aided instruction (the PLATO III system). His organization, he said, is designing and developing an economically viable, large-scale computer-controlled teaching system capable of serving 4000 multipurpose terminals simultaneously. The final panelist was Robert Glaser, Director, Learning Research and Development Center, University of Pittsburgh. He discussed a system called IPI (Individually Prescribed Instruction), in which curricula are broken down into subject areas, each one comprising an instructional entity. The role of the computer in IPI is one of management in that it is used to record data on the student as he completes each unit.

In reporting to the plenary session, Chairman Kurtz stated that his panel had realized that work in the area of computers in instruction is still very diverse and in its early stages. Therefore, the recommendations offered would be more general than specific. The computer utility can serve education in this context in many ways; for example, the computer capability can not only present programmed material but offer a means for the expression of student creativity. The problem of compatibility will affect the application of the computer utility and future developments in educational software must consider this situation. This means that the educational community needs to keep informed about technological developments. The panel recommended continued experimentation but with learners, teachers, and administrators playing a more active role than heretofore. Experiments should also reflect the diverse needs of the various segments of the community rather than just the needs of the formal educational sector. It was also recommended that the interchange of information about current work and experimentation be promoted by EDUCOM, perhaps through a series of seminars.

### AN OVERVIEW OF THE SYMPOSIUM

The next phase of postconference action is the study of the presentations, the discussion, and the panel recommendations with a view to combining them into a symposium viewpoint which will be promulgated to participants and EDUCOM members as a part of the continuing dialog on the role of the computer utility. A small committee of key participants is performing this function, and as a first step Manley Irwin, a Co-

Director of the conference, prepared a draft summary. Excerpts from his paper are presented in the following paragraphs.

The application of remote-accessed computers is creating a high degree of interdependence between the educational community, firms in the private sector, and agencies and bodies in the public sector. This interdependence merits exploration—for it represents an intimacy somewhat unprecedented in the experience of all institutions concerned.

This same interaction should occur between the educational community and the communication common carriers. One immediate need of the former is a greater knowledge regarding line rates, tariff schedules, equipment charges, alternative transmission media such as microwave, CATV, and satellites. The educational community also needs an exchange of information about lines, switching, and terminals as part of its goal of making digital technology responsive to the needs of the student, the teacher, and the teacher/researcher. A closer working relationship with the carriers as well as closer affiliation with the professional organizations such as the Association for Computing Machinery, the American Federation of Information Processing Societies, the American Society for Information Science, and with trade associations such as the Business Equipment Manufacturers Association merits consideration.

Education's interface with the public sector is critical. Policy decisions, whether promulgated by Congress, regulatory bodies, or the Executive branch, apply with equal validity to the educational community and the business community. A common bond of interest between education and business exists in such areas as privacy, regulation, rates, and standardization. All influence computer and network configuration, and all bear on the ultimate cost, and hence feasibility, of remote-access services.

Consider manufacturers of computer hardware and equipment, and firms rendering communication common-carrier services within the private sector. Although there is some disagreement as to how educational needs may influence the design considerations and hardware decisions of computer suppliers, it is generally conceded that education's stake in such decisions is direct and real. Certainly, the world of education seeks information in such obvious areas as computer software, hardware, standardization, and program compatibility. At the same time, the higher education may possess requirements that are unique, separate, and apart from the needs of the commercial activities. These needs ought to be so presented that they will be included in the planning horizons of manufacturers and suppliers of equipment and systems.

The plenary-session discussion brought out several alternatives in searching for an educational viewpoint. These included the creation of an educational board within the Federal Communications Commission; an

*continued on page 6*



EDUCOM's Fall Council is held this year in the University of Notre Dame's Center for Continuing Education. Located on campus, the Center has complete facilities for our business and workshop sessions. Participants will be housed in the Morris Inn, across the street from the Center, or in nearby motels. Transportation will be provided.

The program this year is a varied one, intended to supply Institutional Representatives and other attendees with information of both specific and general interest. The first morning, 13 October, will be devoted to three semiworkshop sessions, each one covering an EDUCOM program area. The concept is to have a small group under a Chairman explain and discuss a program and react to audience questions or suggestions. For example, the Computer Resources workshop will take the form of a meeting of the EIN Executive Committee. Attendees may choose to attend any of the workshops.

The business meeting will take place Monday afternoon and will be open to all attendees. Voting will be limited to Institutional Representatives or their designated alternates. An important matter to be presented will be the report of the Membership Committee, which proposes admission of junior colleges to EDUCOM. The banquet following the business meeting will feature Senator Mike Gravel of Alaska as Speaker. He will describe the plans for using satellite communications to bring educational television to Alaska.

The morning of 14 October will feature a full session devoted to Federal legislation and its relationship to higher education. The afternoon has been left free for visiting the computer center and other points of interest on the campus. This year, for the first time, wives are being officially invited to attend the Council. Mrs. Don Mittleman, wife of the director of Notre Dame's computing center, has planned a program especially for the ladies. Highlights include an international fashion show, a unique musical presentation by the campus orchestra, and breakfast with a leading artist at O'Shaughnessy Art Gallery. Registration fee for wives will be \$15 to cover the cost of meals and tours.

# EDUCOM FALL CENTER FOR CONTINUING

## SUNDAY, 12 OCTOBER

4:00-7:00 PM	Registration	MORRIS INN
6:00	Board of Trustees Dinner Meeting	MORRIS INN
8:00	President's Open House	MORRIS INN EDUCOM Suite

## MONDAY, 13 OCTOBER

8:30-9:20 AM	Registration Coffee Hour	CENTER LOBBY
9:30	Meeting convenes Martin Greenberger, <i>Chairman</i>	AUDITORIUM
10:00-12:00	WORKSHOP SESSIONS	CENTER
	<i>Computer Resources</i> (EIN Executive Committee) Thomas A. Keenan, EDUCOM, <i>Chairman</i>	Room 202
	<i>File Resources</i> Margaret Park, Computer Science Center, The University of Georgia, <i>Chairman</i>	Room 100
	<i>Administrative Resources</i> Murray R. Wigsten, EDUCOM, <i>Chairman</i>	Room 104
12:15 PM	Luncheon	CENTER DINING ROOM
1:45-4:30	Business Meeting Martin Greenberger, <i>Chairman</i> Report of the Nominating Committee Elections President's Report Report of the Membership Committee Applications for Admission Other Business	AUDITORIUM
6:00-7:00	Reception	O'SHAUGHNESSY ART GALLERY
7:00	Banquet <i>Speaker: The Honorable Mike Gravel, Senator from Alaska</i>	MONOGRAM ROOM



# COUNCIL 1969

## EDUCATION • NOTRE DAME

### TUESDAY, 14 OCTOBER

8:00-9:00 AM     Registration     CENTER LOBBY  
                    Coffee Hour

9:00-12:00     SYMPOSIUM     AUDITORIUM  
Legislative Activity of Interest to Higher Education. Joseph Becker, Vice President, EDUCOM, Moderator

*Libraries and Funding*  
Eileen Cooke, Legislative Research Assistant, American Library Association

*Legislation and Privacy*  
Paul Baran, Treasurer and Senior Fellow, The Institute of the Future

*Communication and Tariffs*  
Stanley S. Neustadt, Senior Partner, Cohn & Marks, Washington, D.C.

12:30 PM ON     Transportation to Airport  
                    (by arrangement)

### LADIES' PROGRAM

### MONDAY, 13 OCTOBER

9:30-11:45 AM     MORRIS INN  
Brunch with Cosmopolitan Wives  
International Fashion Show

2:15-4:30 PM     Conducted campus tour followed by a  
musical program and refreshments

### TUESDAY, 14 OCTOBER

9:00-11:45 AM     O'SHAUGHNESSY ART GALLERY  
Continental breakfast with a working artist

AFTERNOON     A tour of South Bend's Botanical Gardens  
A tour of Moreau Seminary  
(arranged by request)

*Note: Wives are invited to attend the luncheon and banquet. The price of the tickets has been included in the Registration Fee.*

EDUCOM 1969 FALL COUNCIL • 12-14 OCTOBER • NOTRE DAME, INDIANA

### ACCOMMODATIONS DESIRED

	Night(s) of October	12	13
Single Room	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Double Room	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Share Double	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

MRS. \_\_\_\_\_

will attend the

Fashion Show ☐ Campus Tour ☐

Luncheon ☐ Banquet ☐

Ladies' Registration Fee, \$15.

NAME _____	INSTITUTIONAL REPRESENTATIVE <input type="checkbox"/>	GUEST <input type="checkbox"/>	NONMEMBER <input type="checkbox"/>
AFFILIATION _____	Please enclose \$25 fee (includes Luncheon and Banquet)		
TITLE OR POSITION _____	I PLAN TO ATTEND THE		
ADDRESS _____	MONDAY LUNCHEON (\$3.00) <input type="checkbox"/> BANQUET (\$7.00) <input type="checkbox"/> TOTAL ENCLOSED \$ _____		



# meetings and conferences

*Listings are for information only and do not constitute an endorsement. Institutional representatives are encouraged to submit notification of meetings of interest to a broad range of faculty and staff of member organizations. A lead time of about three months is desirable.*

- 24-25 Sept. **"Video Tape Recording" Institute**  
Madison, Wisc.  
S/C David P. Hartman, Institute Director  
725 Extension Building  
432 North Lake Street  
Madison, Wisc. 53706
- 1-5 Oct. **32nd Annual Meeting of ASIS**  
San Francisco  
S/C Charles P. Bourne, Director  
Programming Services, Inc.  
999 Commercial Street  
Palo Alto, Calif. 94303
- 5-8 Nov. **The Library-College Associates**  
LaSalle Hotel, Chicago  
S/C Dorcas Scalet  
Library-College Associates  
Box 956  
Norman, Okla. 73069
- 9-12 Nov. **Annual Convention of National Association of Educational Broadcasters**  
Sheraton-Park Hotel, Washington  
S/C Pat Moran  
NAEB  
Tel.: (202) 667-6000
- 9-13 Feb. **Systems Engineering Institute**  
Tucson, Ariz.  
S/C Director, Conferences and Institutes  
Division of Continuing Education  
University of Arizona  
Tucson, Ariz. 85721

*continued from page 3*

increase in the role of the National Commission on Library and Information Sciences; and the establishment of closer rapport with the American Council on Education. The specifics of these proposals are not as important, however, as what is fundamental: that higher education interface with the public sector in order to make the educational requirements an element in government decision making.

Finally, the plenary session disclosed a serious communication gap within the educational community. What is required is a renewed effort to share programs, to share experience, and to share the results of each one's research efforts. The Educational Information Network of EDUCOM marks, of course, a first step. We are just on the threshold of knowledge in the applications of data banks, programmed instructional material, and standard language systems. We have much to learn about the technological impact computers will have upon regional and national communication systems of universities and colleges. One point is clear: the cost of isolated pockets of knowledge is high indeed.

The plenary session suggested that the decision-making process inherent in the application of computer-utility services is isolated, fragmented, and incomplete. Stated differently, the substantive issue of the computer utility cannot be separated from the procedural issue. Indeed, the procedural question is assuming an order of first priority. A means must be found which will enable the business, education, and public sectors to interface and mutually share interdependent goals and responsibilities. The matter of dissemination of information among these three bodies is a moot point. It is increasingly clear that the exchange of ideas must be continuous rather than ad hoc. The success of introducing the computer-utility concept in higher education depends to a large extent on a recognition that the information revolution has placed new horizons and responsibilities on all of us.





## networking notes

*This space will be used to report, as a matter of information, plans for, development of, or status of networks in various media outside of EDUCOM research programs.*

Members of the National Cable TV Association meeting this summer heard a proposal to establish a 6-channel network which would carry programs via COMSAT's satellite to 36 ground stations throughout the nation. From there, the programs would be beamed to cable TV systems. Two of the six channels would be made available to the Corporation for Public Broadcasting; one of these would be for instructional television at no cost to educators.

CATV as a national information network appears to be the hope of pioneers in the field. A recent commercial estimate has some 3.6 million homes wired for cable TV at present. With a \$25 installation fee and a \$5 monthly service charge, operators anticipate an increasing rate of home installations over the next few years.

The Trans American Television Corporation is working on putting together a network of videotape playback centers across the country. Programs will be prepared at headquarters and distributed to cooperating affiliates, who will offer them for business and professional use at meetings.

A new document-transmission system, adaptable to network usage, is under study by a New York firm. The concept ties together microform and facsimile technologies for the transmission of filmed images over conventional telephone lines.

Over the past two years, the University of Connecticut's Radio/TV Center working with the Southern New England Telephone Company has made significant strides in perfecting its microwave television network. The facility, which can transmit lessons to six branch campuses, as well as locally, now has a talkback capability. A directional microphone in each receiving classroom makes dialog with the instructor possible, as he appears on the television screen. The response can be seen and heard in all classrooms. This personalization of the system has resulted in wide campus acceptance of the network presentations.

Using technological developments from the U.S. space programs, Wayne State University in Detroit, Michigan, has installed pushbutton dial stations in nine campus buildings. These contain booths, headset equipment, and pushbutton dial units which allow students to locate and hear pretaped lessons. In six stations, students can hear programs that instructors have dialed and fed over a public-address system.

## KELLOGG AID RENEWED

The W. K. Kellogg Foundation has renewed its support of EDUCOM with a five-year grant totalling \$600,000. This expression of confidence in the future of the Interuniversity Communications Council follows the expiration of the original grant from the Foundation, which enabled EDUCOM to come into being five years ago. The funds are to be applied to aid universities in developing the potential for continuing adult education inherent in evolving techniques and concepts of communications, learning, and information storage and retrieval.

EDUCOM, which began as a group of eight universities, now has over 100 member universities, colleges, and other institutions of higher education in the U.S. and Canada. It has several research projects in networking and related areas, and acts as a voice and forum for its members through its meetings and publications programs.

## APPROPRIATION CUTS CONTESTED

Although Congress has authorized \$8,896,418,925 for educational programs in 1970, the administration has proposed a budget of \$3,321,745,455. (This is \$1,357,433,000 less than that requested by the U.S. Office of Education.) Presently, a budget raise of \$1,045,000,000 has been proposed, and it is in the stages of passage under the Labor HEW Appropriations Act for 1970. Whether this passes will not be known until late September, at which time it is hopeful that additional appropriations can also be added to the 1970 budget.

Not only have the U.S. Office of Education cuts been recommended by the Bureau of the Budget, but the House Subcommittee on Independent Offices has recommended that the National Science Foundation be cut from approximately \$500 million to \$420 million. (Senate appropriations hearings on the NSF budget may continue until August.)

Specific project areas that are affected include the Networks of Knowledge Act. [EDUCOM 3, No. 2, 7 (Mar. 1968.)] Guidelines for this act are in the final stages of preparation by the U.S. Office of Education's Division of College Support, but implementation will be deferred unless Congress reinstates the appropriation requested.

A committee consisting of the National Education Association, National Catholic Education Association, American Council on Education, the Urban Coalition, the American Library Association, and the American Book Publishers Council has been formed to fight these budget cuts. It is headquartered at the Congressional Hotel, 300 New Jersey Avenue SE, Washington, D.C. 20003.



# EDUCOM PUBLICATIONS

The publications of the Interuniversity Communications Council are listed below. They have been printed and bound in distinctive EDUCOM covers and are available to individuals both in member institutions and nonmember organizations. All are dated 1969, except as noted. While many of the publications are the reports of completed research performed under grant or contract, others have been prepared by the staff in response to a request or a demonstrated need for investigation. Normally, each member institution will receive a copy of each publication through its Institutional Representative, either automatically or on request. Sufficient additional copies have been printed to supply interested individuals. They may be ordered by number (or title where there is no number) from the list below. The member price applies to individuals affiliated with member institutions. Both prices include postage. Checks or money orders, made out to EDUCOM, may accompany the order, or the purchaser may request billing.

## STAFF PAPERS

- SP-169     A Master Technical Plan for the National Mental Retardation Information and Resource Center.** Tadashi Mayeda. 72 pp., 1 chart. No charge; limited availability.

Prepared at the request of the President's Committee on Mental Retardation. Gives background of the request, describes—in functional terms—a

proposed NMRIC and presents a technical plan for its establishment through 14 distinct tasks.

- SP-269     Digital Storage of an Academic Library Book Collection—Nontechnological Information to Aid Consideration.** Wallace C. Olsen. 374 pp., 20 figs., 95 tables, 4 app. \$4 mem.; \$8 nonm.

Provides extensive and basic information for consideration of the problems of digital storage of textual portion of library collections. It is statistically

oriented for nonacademic technologists, and provides, through detailed figures and tables, necessary planning data.

## RESEARCH MEMORANDA (Biomedical Communications Project)

- RM-269     Health Science Libraries Today.** Brigitte L. Kenney. 210 pp., 4 figs., 18 tables, 2 app. \$3 mem.; \$6 nonm.

Categorizes the 6400 libraries serving the biomedical community in functional groups and surveys them in terms of location, facilities, collections, staff, budget, and range of services. Suggests that

they become major components of a proposed biomedical information network. Based on a 1967 survey.

- RM-369     Survey of Interlibrary Communications Systems.** Brigitte L. Kenney. 74 pp., 1 table. \$1.50 mem.; \$3 nonm.

Contains a bibliographic essay on interlibrary communications, both existing and planned, and including descriptions of techniques and equipment.

Presented in sections that discuss mail, telecommunications, television, facsimile, etc.; each section contains a list of references.

- RM-869     Guide to Facilities, Capabilities, and Programs of Medical Schools in the United States.** Tadashi Mayeda. 377 pp. (single side). \$5 mem.; \$10 nonm.

This unique document contains up-to-the-minute information on more than 100 medical schools. Bound for convenient use, but also printed on single sides and prepunched for easy insertion into looseleaf binders and updating. Records a list of

schools by state, an alphabetical index, a name index, a subject index, and a complete section on each school, giving such data as enrollment, library size, key personnel, clinical facilities, and community and related activities.

- RM-969     Role of Audio and Audio-Visual Materials in Enhancing the Learning Process of Health Science Personnel.** William Cooper. 23 pp. \$1 mem.; \$2 nonm.

Discusses increasing use of audio-visual materials: records, tapes, films, and video tapes in biomed-

cine and medical schools. Identifies primary users and gives typical applications.



- RM-1169 Medical Applications of Remote Electronic Browsing.** Joseph Chadwick. 81 pp., 1 fig., 1 table, 1 app. \$1 mem.; \$2 nonm.

Identifies and defines viable remote browsing techniques and requirements for an interactive medical information system to include them. Emphasizes re-

mote viewing of pages and remote interrogation of data banks. Suggests a design approach.

- RM-1269 Information in Health Care.** Tadashi Mayeda. 77 pp., 13 figs. \$2 mem.; \$4 nonm.

Summarizes early work on Biomedical Communications Project and points out information in health care. Differs markedly from information in medical education and research. To increase the effective-

ness of the latter, requirements are upgrading of directories, compendia, and information guides, and regrouping of types and sources of medical information.

- RM-1369 An Annotated Bibliography of Biomedical Computer Applications.** Ruth Allen. 216 pp., author and subject indices. Printed by U. S. Government Printing Office and also available from National Library of Medicine. \$3 mem. and nonm. if ordered from EDUCOM.

Contains about 1000 annotated entries of books, monographs, and journal articles covering the use of computers in the health sciences. Computer-assisted composition was used in entering corrections and preparing the material for print-

ing. Subjects range from data-processing through diagnosis to hospital information systems. Designed to give both background information and specific applications.

- Summary of Research Memoranda.** Joseph Becker. 130 pp. \$2 mem.; \$4 nonm.

Reviews the concept of the Biomedical Communications Project and summarizes each of the 13

reports which resulted from it. (Some are listed above as Research Memoranda.)

## RESEARCH MEMORANDA

- RM-1469 Comparative Study of Languages for Programming Interactive Use of Computers in Instruction.** Karl L. Zinn. 234 pp., 6 app. \$3 mem.; \$6 nonm.

Analyzes and identifies more than 30 existing author languages for programming (in light of growing use of computers for instruction.) Assesses how well the needs of users are being met. Appendices contain a glossary, proposed common char-

acteristics, summary of programming languages, samples of computer programs, guidelines for documenting programs, and a summary of interactive programming languages for student use.

## PERIODICALS

**EDUCOM. The Bulletin of the Interuniversity Communications Council.** Distributed to members at no cost. Subscriptions: \$5 educational rate; \$10 others.

The *Bulletin* appears six times annually during the academic year. It contains information on EDUCOM meetings and activities and articles on the applications of technology to higher education.

It is now in its fourth year. Volumes 1-3 are available on microfiche, either in positive or negative form, \$1 per volume.

**Annual Report.** Distributed to member institutions. Available on request by interested persons.

Appears in the fall of each year. It offers a continuing history of the growth of EDUCOM and

summarizes its activities, projects, accomplishments, and plans.

## EDUCATIONAL INFORMATION NETWORK

**Documentation Standards Handbook for EIN Software Catalog.** June 1969. Staff. 18 pp. Distribution limited to EIN participants and interested parties. (Write: Director, EIN Project.)

Contains standard documentation requirements and a model catalog entry. Designed for use by partici-

pants wishing to submit programs for inclusion in the Catalog.

**EIN Software Catalog.** Staff. (First section of a continuing publication.) Limited to EIN participants and interested parties. (Write: Director, EIN Project.)

Each increment of the Catalog contains from 10 to 20 programs, documented in accordance with the Handbook. Sufficient information is given so

that the potential user can determine if the program will suit his needs. Contains sample input and output from each program.

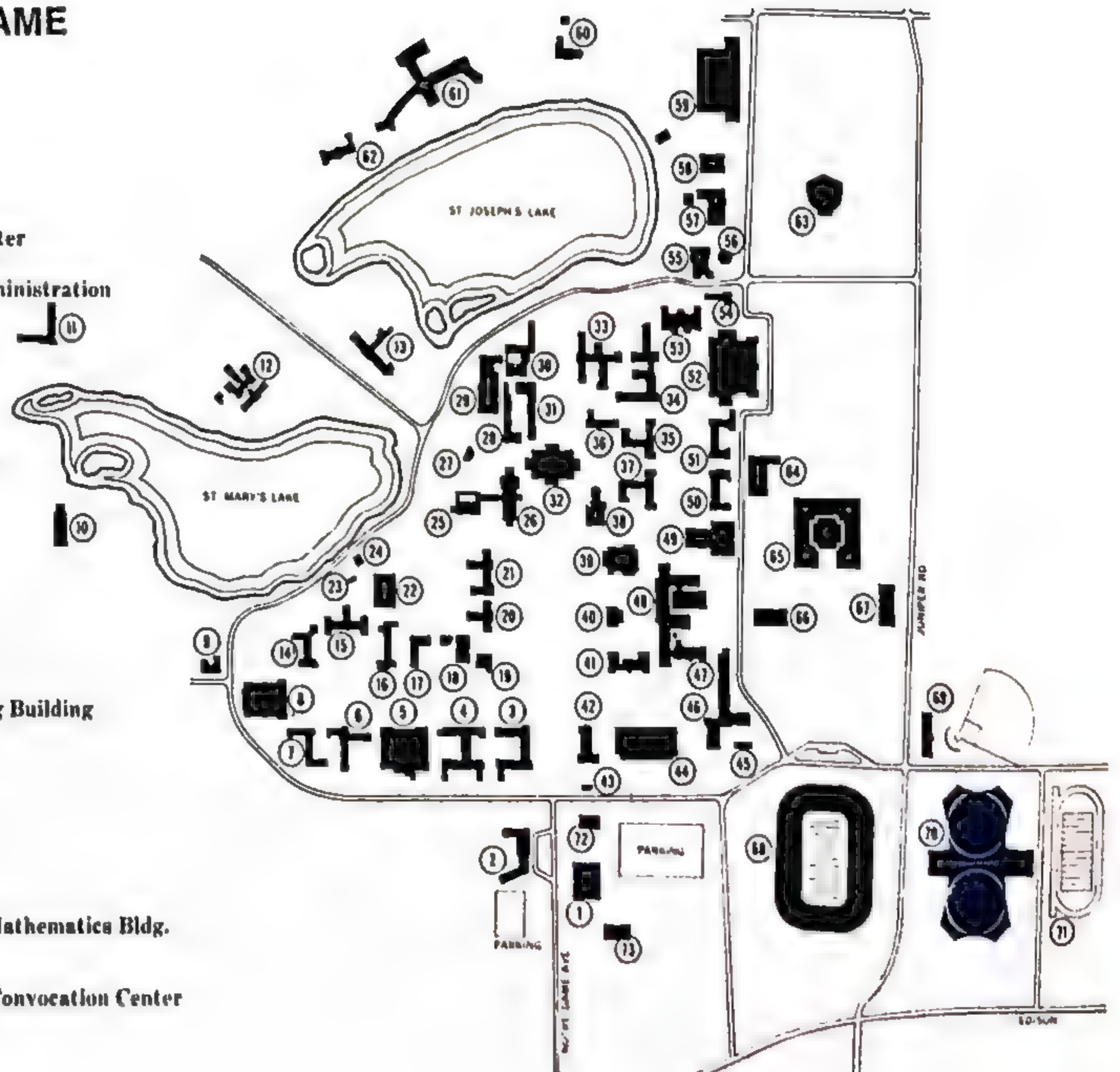


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## MAP OF UNIVERSITY OF NOTRE DAME

- |                                    |  |
|------------------------------------|--|
| 1. Center for Continuing Education | 37. Cavanaugh Hall                           |
| 2. The Morris Inn                  | 38. Washington Hall                          |
| 3. Alumni Hall                     | 39. LaFortune Student Center                 |
| 4. Dillon Hall                     | 40. Psychology Department                    |
| 5. South Dining Hall               | 41. College of Business Administration       |
| 6. Fisher Hall                     | 42. The Law School                           |
| 7. Pangborn Hall                   | 43. Bus Stop                                 |
| 8. Rockne Memorial Building        | 44. College of Engineering                   |
| 9. Military Science Building       | 45. Sculpture Studio                         |
| 10. DuJaric Hall                   | 46. O'Shaughnessy Hall                       |
| 11. Fatima Retreat House           | 47. Chemistry Building                       |
| 12. Holy Cross Seminary            | 48. Nieuwland Science Hall                   |
| 13. Columba Hall                   | 49. Field House                              |
| 14. Lyons Hall                     | 50. Breen-Philips Hall                       |
| 15. Morrissey Hall                 | 51. Farley Hall                              |
| 16. Howard Hall                    | 52. North Dining Hall                        |
| 17. Badin Hall                     | 53. Biology Building                         |
| 18. Bookstore                      | 54. Fire Station                             |
| 19. Post Office                    | 55. Power Plant                              |
| 20. Walsh Hall                     | 56. Water Tower                              |
| 21. Sorin Hall                     | 57. Ave Maria Press                          |
| 22. Architecture Building          | 58. Mechanical Engineering Building          |
| 23. Log Chapel                     | 59. Maintenance Center                       |
| 24. Old College                    | 60. Holy Cross House                         |
| 25. Corby Hall                     | 61. Moreau Seminary                          |
| 26. Sacred Heart Church            | 62. St. Joseph Hall                          |
| 27. Grotto—Our Lady of Lourdes     | 63. Stepan Center                            |
| 28. Geology Building               | 64. WNDU Radio and TV                        |
| 29. Laundry                        | 65. Memorial Library                         |
| 30. Lewis Hall                     | 66. Radiation Research                       |
| 31. Brownson Hall                  | 67. Computer Center and Mathematics Bldg.    |
| 32. Administration Building        | 68. Stadium                                  |
| 33. Student Infirmary              | 69. Aero-Space Building                      |
| 34. Keenan-Stanford Halls          | 70. Proposed Athletic and Convocation Center |
| 35. Zahm Hall                      | 71. Cartier Field                            |
| 36. St. Edward's Hall              | 72. New Post Office                          |
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# EDUCOM

Bulletin of the Interuniversity Communications Council (EDUCOM)





# EDUCOM BULLETIN

Vol. 4, No. 6

December 1969

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2. Legislation, Privacy and EDUCOM
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9. Council and Board Chairmen  
Wakefield New Trustee

**Paul Baran**

**On The Cover.** Institutional Representatives get down to serious discussion on the problems of sharing resources, during one of the three working sessions held at the Fall Council at Notre Dame. This small group interaction has been received favorably and will be a feature of EDUCOM's semiannual meetings.

**EDUCOM as a Communication Vehicle** — One of the reasons for the direct-mail program, which is still growing, is the hope of making the Bulletin truly a communication vehicle instead of a unidirectional information device. A preliminary step was the solicitation of articles from member institutions and authorities in areas of EDUCOM interest. Now we are asking for a response to the ideas offered by Paul Baran in this issue about the role of EDUCOM. Representative replies will be published in the Bulletin, so that the dialog begun at the Fall Council can be continued.

Also, in an early issue, we plan to start a "Washington page" which will summarize the current legislative/administrative actions on the Hill and in the agencies that are directly related to technology and funding problems in higher education. The material will be gathered by a Washington-based correspondent, especially for the Bulletin.

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## FALL COUNCIL EXPANDS MEMBERSHIP

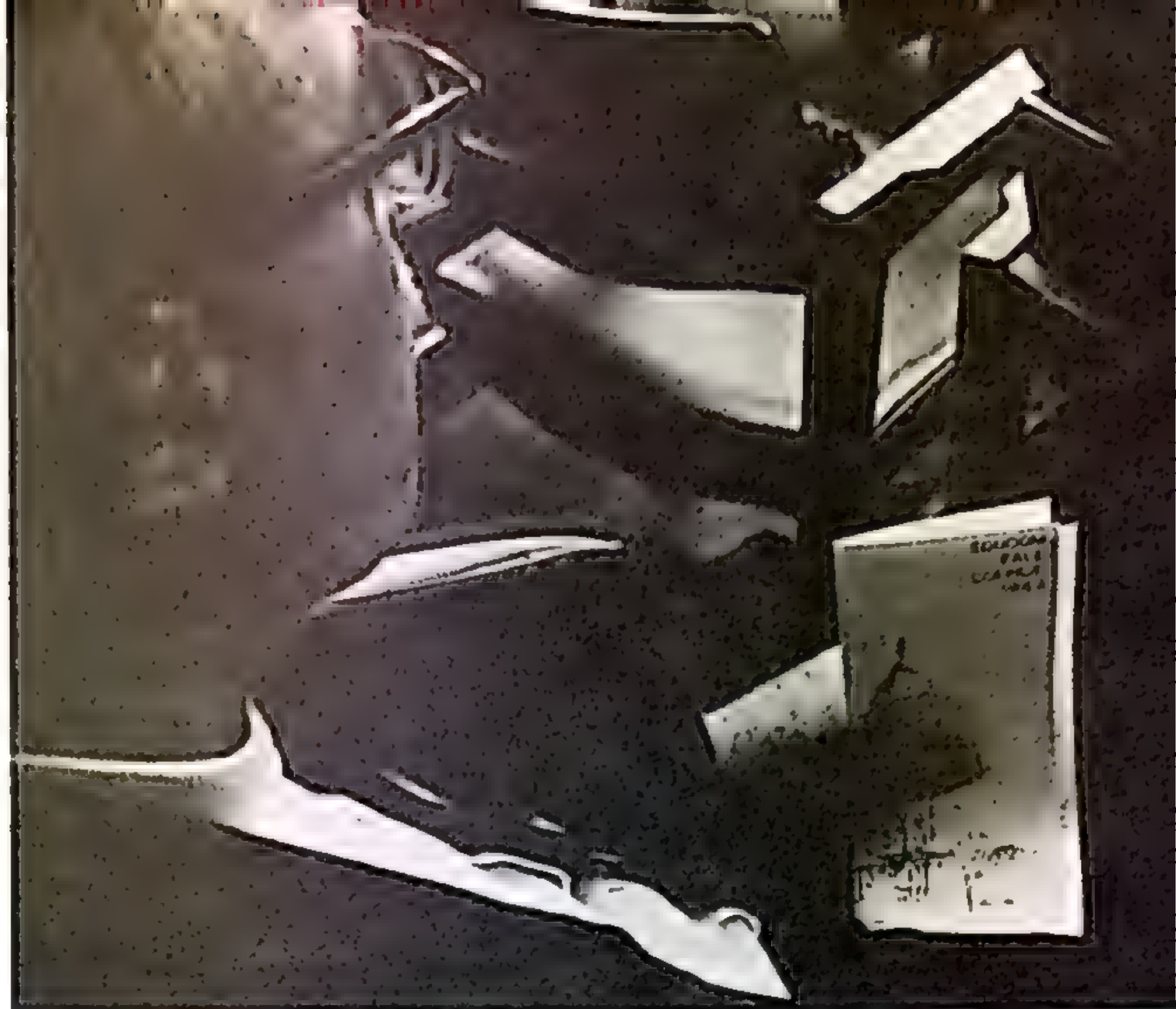
The Fifth Annual Council of EDUCOM convened in Notre Dame's new Center for Continuing Education on Monday afternoon, 13 October 1969. The two most significant actions taken were an expansion of the membership potential and approval of a mail-ballot system for elections. A new Chairman was elected by the Council, along with three Institutional Trustees and a Nominating Committee; two new members were admitted to EDUCOM; Boston was selected as the site of the Spring Council; and a report on the status of the Bulletin's direct-mail experiment was given.

### NEW ELECTION PROCEDURES

As the first order of business, the Chairman of the Nominating Committee presented the slate of candidates for positions becoming vacant. Don Mittleman, Director of the Computer Center at Notre Dame, was elected Chairman of the Council. Three Institutional Trustees were elected: Martin Greenberger, The Johns Hopkins University; William Stucker, University of Missouri; and Harold Wakefield, State University of New York. The latter two will begin a second three-year term of office.

The new Nominating Committee is: J.A.E. Bardwell, University of Saskatchewan; Russell W. Burris, University of Minnesota; Bowen C. Dees, University of Arizona; John Gunter, University of Dayton; W. Carl Jackson, Pennsylvania State University; and R. G. Selfridge, University of Florida. The Committee was charged with a new task — that of reviewing the credentials of each Institutional Representative during the coming year and then selecting two or more candidates for each position to be filled. In this way, each IR will have the opportunity for consideration and election.

Another change in the election procedure lies in the planned use of a mail ballot, on which candidates and information about them will be listed. The ballots will be sent out before the Council, thus giving a voting opportunity to all Representatives, whether or not they attend the annual meeting.



### MEMBERSHIP REQUIREMENTS

The results of a year-long study by an Ad Hoc Committee on Membership, as approved by the Board of Trustees, were presented to the Council in the form of a resolution which was approved unanimously. In its deliberations, the Committee had taken a conceptual view of membership, rather than a strictly organizational one. Membership requirements were defined in terms of interest and participation, and then in terms of organizational structure. Applicants must:

1. show evidence of primary interest in higher education;
2. demonstrate significant concern with the use of technology in resource sharing;
3. be a college, university, junior or community college, a university sponsored consortium or functional organization, or a university oriented service organization.

In addition to present members, colleges, universities, and community (junior) colleges will have the vote and all services; other members admitted will receive all services, but not a voting privilege. Applications for membership and problems of membership and procedures will be reviewed by a permanent Committee on Membership and Procedures.

Applications from the University of Alabama in Tuscaloosa and the Universite Du Quebec were approved by the Council. The former was, until recently, a part of the University of Alabama at Birmingham (an EDUCOM member) but is now separately administered and eligible for individual membership. Quebec is a new, decentralized university with its headquarters in Montreal.

### BULLETIN DIRECT-MAIL EXPERIMENT

Beginning in May, return cards requesting the name and address of individuals in EDUCOM member institutions were included in the 100,000 copies sent out in bulk. At present, there have been over 7,000 replies, and the Bulletin is being mailed directly to those respondents.



The following paper is taken from an address made to the Fifth Annual Council of EDUCOM. It reflects the personal opinion of the author and is offered for the information of readers of the Bulletin. Comment on the ideas presented in the paper is requested. A representative group of replies, selected by the Editorial Advisory Board, will be printed in the Bulletin.

# LEGISLATION, PRIVACY AND EDUCOM

Paul Baran  
Institute for the Future

I have been asked to speak on the issues of legislation and privacy raised by the advent of electronic information-processing systems. I plan to cover the subject briefly and then address long-term implications, some of which are of specific interest to EDUCOM. During the last half-year, several excellent and comprehensive selections have been written on computer privacy; for example, Arthur Miller's article in the *Michigan Law Review* and Lance Hoffman's article in the *ACM Computing Surveys*. Add to this the earlier major works of Alan Westin and the consideration of the subject given in recent Congressional hearings. One who is interested is left with the feeling that there is little new to say on the subject.

Even with all that has been said, a solution to the problem of ensuring the privacy of data is still lacking. Like so many of society's complaints, this does not have an easy answer. Either some concepts of law and administrative procedures will have to be bent to accommodate the new problems of privacy, or we may have to develop new institutions — or possibly even learn to live without the level of privacy to which we are accustomed.

In this talk, whenever I speak of EDUCOM, I refer to it not in its present form, an academic consortium trying to live on a limited budget, but rather, I view it (or more likely one of its intellectual offsprings much further in the future) as a logical and evolutionary successor to the bricks-and-mortar university of today that could lead to a system of education much more removed from the accidents of geography and with lessened reliance upon limited local resources and the immediate self interest of local administration.

The present university is undergoing increasing attack. Students today view the university as a set of local fiefdoms teaching irrelevant subject matter and keeping the students in line by requiring them to jump through exercise hoops. Yet, even the more radical students would agree that there is probably no current, workable alternative to the university — certainly, none which could survive. But, at a later date, if we do indeed separate the process of information flow from the bricks and mortar of the university, an alternate form of university education will be conceivable. Unlike the parents — the university, the child — EDUCOM is a very healthy concept; its hopes, however, will need time to materialize.

## LEGISLATIVE EXPECTATIONS

Now that we have touched upon this subversive subject, the evolution of the successor to today's university, we are ready to return to the more specific topic of privacy and legislation. I would first like to review what we might realistically expect from legislation, and what help we might expect from the computer technologists in preserving personal privacy. Then I will review the National Data Bank concept and discuss how, by underestimating the intelligence of Congress and the electorate, it allowed itself to be misunderstood.

As I suggested a moment ago, however, the underlying message goes further than the issue of privacy. The early discussions on computer privacy were marred by simplistic thinking. Technologists, computer systems designers, and statisticians felt that the question of privacy was one for legislation alone. They did not recognize that although there is much that legislation can do, there is much that it can not do.

Life has a way of being more complicated than that. For example, consider the flagrant, widespread advertising of bugging devices in electronic hobby magazines. Legislation was passed. The advertiser no longer proclaims the fun and profit in bugging your neighbor's mattress, but he does attempt to sell identical equipment as miniature electric baby minding devices: "Hear your child crying when he is down the street." The point here should not be misunderstood. In this instance, legislation has helped. The advertising is not nearly so flagrant, and there is less of it. This suggests that the bugging business is less profitable, and hence fewer quantities in use. Some of the more insidious devices — the type used to tap a telephone on the other side of the continent — are no longer marketed openly. Now you have to do it yourself.

Another example concerns the move on the local level to try to keep files accurate by allowing students and parents to see and review their own records. What has been the response? Now we keep two sets of records, much like the psychiatrists who keep two sets — one to be subpoenaed, the other in abbreviated form to record the delicate data.

Laws are only fully effective against men who accept them. Those persons who disagree tend to regard them as merely another intellectual challenge. The police and



the courts are up against two problems: First, the difficulty of ascertaining intent; Second, the ease with which a lawbreaker can conceal a breach of privacy. Thus, the criminal is not only hard to catch but also more difficult to convict.

### OTHER METHODS OF SECURITY

Consider the commodity that is information. It is something that can be stolen and still be there. How intangible can a *good* be? In a domain where laws alone are of highly limited usefulness, we cannot take very seriously the computer-system designers who shrug off the problem by asking, "Why doesn't somebody pass a law?" The computer people who wish to pass the buck to the lawyers have their counterpart in some non-technical souls who wish to pass the problem back to the computer people — "Why don't you simply design a foolproof computer file system?"

Enough has been said in the last few years about the difficulty of building foolproof systems and of the tricks to subvert such systems. There has also been some fine work done on developing techniques to design better, more secure systems. One thing that stands out in reviewing this work is that the bulk of the useful contributions, publicly made, have come almost exclusively from those in the universities and the independent nonprofit organizations. The response to this problem by the commercial sector of the computer industry has been disappointing.

This experience suggests that researchers in the university and in nonprofit organizations can expect to continue carrying a disproportionate portion of the burden of developing both concepts and hardware for the preservation of privacy in future automated data systems. The last paragraph of Arthur Miller's recent major article, "Personal Privacy in the Computer Age: The Challenge of a New Technology in an Information Oriented Society," (*Michigan Law Review*, 67, 6, 1969) contains a directed plea to EDUCOM:

Perhaps the most imperative need at this point in time is a substantial input of human resources to help solve the many privacy problems posed by the new technologists. The experimental laboratories exist — the federal agencies and many private organizations, such as the Interuniversity Communication Council, can provide the necessary structured context in which to test the privacy protecting capacity of hardware, software and administrative procedures.

I know that the fledgling EDUCOM is almost overwhelmed with things it might do. But this plea is one that I hope would be seriously considered, for EDUCOM has a natural role to play here.

I do not mean to disparage the work presently being done by the commercial sector of the computer industry. They, too, have contributed in their hardware and software designs. As a matter of degree, one would have hoped that they pursued these issues diligently, and with less secrecy. This is an arena where silence is almost

equivalent to irresponsibility, and some people act as if they wish to take the Fifth Amendment. In private discussions, I receive the following expression of position from a few of those who are publicly silent:

1. Talking about the problems of privacy in geographically distributed shared-information systems is not conducive to the sale of such systems.
2. We are still trying to meet initial advertising claims of equipment we manufactured several years ago. We have enough software problems without another major complication added to system design.
3. The problems of leaky system design are germane only to a few isolated systems that are carrying "touchy" data.
4. The customer doesn't want safeguards, and is not willing to pay for them.

These points are all well taken. The moral, however, is that we may be making as much of a mistake in expecting the computer manufacturers to straighten out the privacy problems as we have made in expecting automobile manufacturers to design adequate smog-control devices of their own accord and without prodding. Solutions to technological problems cannot be expected without a positive financial reward structure, which does not yet exist.

### POTENTIAL ROLE OF EDUCOM

Of what significance is this to EDUCOM? The data EDUCOM presently contemplates exchanging appear innocuous. But let us return to the long-range view of EDUCOM as a major experiment in applying technology, in sharing resources, and in providing a major improvement in the flow of information among universities. EDUCOM is probably the organization that best appreciates the essential ingredient of higher education which is the *information* available and transmitted to the student, not the structure of bricks and ivy in which the student exists.

Any organization that still remains in the forefront of this information exchange business, even five years after its incorporation, is, in my mind, already an institution. As an outsider, I am probably in a better position to view what is happening. And if not a better observer, at least I am in a position to be less modest about it. While EDUCOM may be concerned with the seemingly great difficulties of coping with the most modest of information-sharing efforts, one on the outside can look at this in more global terms and visualize the eventual evolution of EDUCOM into an organization capable even of coupling the members of those "invisible colleges" — the men who share rough drafts and semipersonal research-data files.

Of course, there are other technical communications systems now in use — the professional and technical societies, for example. These efforts, however, tend to be restricted to individual and rather specific subject areas which are already recognized. Most of the important



action takes place before a field is recognized as a field; therefore, EDUCOM is in a unique position to trigger a future universal/intellectual interchange.

Thus, I believe that EDUCOM, or a successor, or an offshoot responding to a series of pressures, may well be the nucleus of an electronically interconnected world university, one that might some day even move from the role of a consortium common servant to that of a conglomerate holding corporation in education — and all that this implies. Its position in the information exchange process could cause it to evolve from that of a communications channel to that of a *keeper* of the channel.

### THE NATIONAL DATA BANK PROBLEM

If EDUCOM does move along lines anything like these, then it could find itself exposed to the public scrutiny that befits those institutions upon which society confers, even reluctantly, major power. With the vacuum of alternative institutions, EDUCOM could find itself in an expanded role, unprepared. And it could find its intentions as misunderstood as the proponents of the National Data Bank found theirs. Perhaps the analogy is strained, but I think that it is one that should be considered.

The original National Data Bank (wisely renamed two years ago as the Federal Statistical Data Center) was also to be a resource-sharing agency to expedite communication of statistics within the academic community. It proposed to gather together the thousands of existing magnetic computer tape records in various government agencies to create a new national information resource for research purposes. Its proponents sought to eliminate costly duplication of records and loss of historical data. They also sought to permit new uses for data: for example, it would permit researchers to build better models of our economy, allow a wider access to more data, and, by improving the data-collection process, increase the feasibility and accuracy of various analyses of social problems such as welfare.

The public outcry about the National Data Bank was triggered by a classic public relations mistake, one of the finest of the decade. The very presumptuousness of the name, "The National Data Bank," was almost enough in itself. A more infuriating title could hardly have been found to arouse public anger. These words were, at least in retrospect, ones that begged interpretation in literal terms: an image of a massive, centralized dossier file open to Big Brother or any of his alternative, incarnate forms. Whether the image was real or not proved irrelevant; image and reality become inseparable in dealing with the complex. The computer, to the public, is the epitome of complexity; the result — almost a predestination to public emotional violence.

The seething fears long accumulated in a continuous stream of blatant misuse of now computerized personal data files emerged. The formal name, "National Data Bank," was all that was needed to create a lightning rod to attract the bolts of legitimate outrage pent up in storm clouds of emotionalism. Of course, the problem had been

with us for a long time, and it still is. But this was the first highly visible and tangible outlet for the complaint. The specific proposal, offered initially, had an Achillean Heel: its long-term implications. The original proposal was totally lacking in mechanisms to ensure the right to privacy of those individuals whose records were to be manipulated in order to derive statistics.

The dissection of the Data Bank proposal in Congressional hearings, particularly the analysis of the depth of thought that went into anticipating its long-term consequences, was both painful and amusing. It was a case where some otherwise erudite witnesses believed that they were dealing with unsophisticated Congressmen — always a bad mistake, but doubly bad if one hasn't done his homework. When questions were asked about privacy controls and the ease of misuse of the files, it was clear that the proponents of the system had not only neglected their homework, but they had tried to design the system details "at the blackboard."

The public press, sometimes more interested in attention-getting headlines than in a balanced presentation of complex issues, mishandled the subject. The Congressional hearings, which were much more balanced than their press coverage, set off a major and highly useful continuing public debate on the larger issue: "How shall we control the technological development of electronic information systems carrying personal data, balancing the attainment of the greatest efficiency in government against the price of minimum loss of personal freedom?"

The discussion goes on. No one has the answers, yet.

### EDUCOM AND DATA BANK COMPARED

It is not possible to draw out a one-for-one analogy between the fate of the National Data Bank and the future evolution of what is now EDUCOM. But some points are worth thinking about:

1. Both are new institutions.
2. Both are new institutions whose need is increasing.
3. Both are academically inspired and seek to fulfill academic ends.
4. Both institutions can be highly centralizing in their control, although distributing access more broadly.
5. Both may have to live at the pleasure of the Federal Government, and could be regarded as possibly threatening to the historic rights of freedom of choice, if subverted.
6. It is too early to see where either institution is going, or might go, in the long-term future.

EDUCOM, however, is evolving slowly. Even if it's just able to stay around as technology improves and needs increase, it is not inconceivable that time could thrust EDUCOM into a position with the major institutions in higher education.

I think that society has the right to ask, and EDUCOM the responsibility to answer, "What is your contingency plan for success?" "Where are we all going if you are completely successful in achieving your goals?"



# EIN SERVICE INITIATED AT COUNCIL

The Fall Council of EDUCOM at Notre Dame on 13 October 1969, was the scene of the initiation of operational service by EIN (Educational Information Network). This important stage in the development of EIN was presented and discussed at a workshop session of Technical Representatives and other interested attendees, held in conjunction with the Council. At the core of the session was a meeting of the Executive Committee of EIN for the purpose of explaining the application of the service and the administrative procedures for using it.

At the beginning of the workshop, Dr. Thomas Keenan, Executive Director of EIN since its inception in July, 1968, announced his resignation from that position to accept an appointment to the National Science Foundation Office of Computing Activities. He turned the session over to Dean Demos Eitzer, Director of Audio-Visual and Computer Affairs, City University of New York, the new Chairman of the EIN Executive Committee. Dean Eitzer introduced John LeGates, who has recently joined EDUCOM as Manager of Operations for EIN.

Mr. LeGates was formerly Vice President of Cambridge Information Systems, where he was involved in the development of computer systems to aid hospital management. He has also been associated with Bolt Beranek and Newman in the application of time sharing to secondary school instruction. A graduate of Harvard in mathematics, he has also done graduate work at Yale and is a Kent Fellow.

## EIN VIDEO PRESENTATION

EDUCOM's interest in the applications of new communication technology was evidenced in the workshop with the presentation of a video tape made at the studios of Northeastern University in Boston. In demonstrating the method of using the EIN service, it uses interviews with the principals of the network juxtaposed with sequences dramatizing the steps to be taken by the users in member institutions to locate applicable programs and to get them to the pertinent resource for fulfillment. [The tape runs 23 minutes and is available on loan from the EIN office on ½ inch, 1 inch, and 2 inch SONY video tape and also on 16 millimeter sound film.]

Discussion which followed the tape brought out its potential as a vehicle through which Technical Representatives or Institutional Representatives, as well as those institutions interested in joining EIN, could explain the network to faculties and administrations.

## DOCUMENTATION, SUBMISSION, DISTRIBUTION OF PROGRAMS

At this point the session was thrown open to the floor for discussion among the attendees, and between them and

the Executive Committee. The participants were not only the present Technical Representatives but also attendees from EDUCOM member institutions and other organizations interested in the project. One of the subjects that was discussed was the procedure for documenting programs to be listed in the *EIN Software Catalog*. The expressed opinion was that those procedures listed in the already published *Documentation Standards Handbook* were generally satisfactory. The *Handbook* has been widely distributed and is available to interested parties without cost. Several member institutions have used the standards specified in the *Handbook* as a guide for their own internal documentation. It was pointed out that the programs submitted in other forms have to be edited and documented by EIN personnel, creating a time delay in the publication of additional catalog supplements. Priority therefore falls to those programs already documented in close accordance with the specified standards. Discussion arose about the validity of a relatively brief documentation of complex programs. A solution to this situation might be a review prior to publication. This would be done by the submitting resource. EIN will initiate this review at such time as the publication schedule is sufficiently advanced to permit the necessary time lapse.

Another form of review which was recommended and adopted by the Executive Committee is the circulation of a list of programs that are presently under consideration for publication. Members of EIN can then assist the process by indicating those which they think most useful and also by noting additional programs of their own which relate to those listed. This type of feedback will encourage participation by member institutions. It will also stimulate interest within the institution, and help the TR find out where his user's interests lie.

Some of the questions put to the EIN Executive Committee concerned the advantages of listing computer programs in the *EIN Software Catalog*. An immediate answer was that, under the EIN system of charges, use of a computer program outside of an institution can increase the revenue at that particular organization's computer center. At a more personal level, the authors of the unique program obtain recognition for their work through the medium of a catalog listing. In this connection, the committee stated that scholarly journals would be asked to print notices of the EIN listings in a manner similar to the present bibliographic listings of scholarly articles. At a practical level, the listing of a program establishes computing credit of a center, which is prerequisite for access to other programs within the network.

## NETWORK USAGE PROCEDURES

At the workshop, the Job Run forms and Account Initiation forms were distributed for the first time. The latter is



an official notification of intention to use a program listed by another member. The initiating institution fills in the form, sends it to the EIN central office which approves and records it and then forwards it to the resource having the desired program. In this way, a permanent account is established between two organizations. The Job Run form is used as a direct means of communication between the requester and the resource. Quantities of these forms have been sent to the Technical Representatives and will be provided to new members to the network.

The EIN accounting system requires that some form of credit be established prior to network use. The credit can be initiated by a cash deposit, by purchase order, or by making available to the network an amount of computing power with a value of up to \$1,000. The latter method may only be used by those resources which have one or

more programs listed in the *Catalog*. In this way, maximum mutual use of the network is encouraged because a minimum of cash has to be transferred and accounted for. At the request of some of the attendees, other methods of establishing credit will be evaluated.

The *EIN Software Catalog* has already been distributed to Institutional Representatives and to Technical Representatives. It is contained in a large ring binder so that supplements, three of which have already been published, may be conveniently inserted. Two copies are automatically sent to each Technical Representative; additional copies, with the supplements as they appear, can be ordered for \$75.00 each per year.

The workshop provided a convenient form for the exchange of ideas. These meetings will be held regularly at the EDUCOM meetings.



A serious moment at the EIN Workshop

## A SUMMARY OF THE FILE RESOURCES WORKSHOP

A workshop on File Resources was also held at the Fifth Annual Council, 13 October 1969, at Notre Dame. The panel that had been gathered for the session consisted of Margaret Park, Chairman; and Hilary Lent Burton, Allen Kent, and John A. Vinsonhaler, members. Richard Ferguson, EDUCOM Staff Information Scientist, was the coordinator, and the participants included both Institutional Representatives and Correspondents in the EDUCOM research area identified as Libraries and Databanks.

### PROBLEM AREAS EXAMINED

The session began by posing four questions to the participants:

1. *Are there file resources available and wanted for sharing among our member institutions?* This question seemed to point to the need for file resources and the problem, how to involve user/suppliers in the resource-sharing task.
2. *What organizational tools and capabilities are needed to facilitate file-resource sharing?* This question presup-



posed that there were benefits to be gained by sharing file resources among organizational members. Without begging the question, the next step was to decide what resources or tools and capabilities then seemed necessary.

3. *What problems are associated with the cooperative use of file resources?* While it seemed likely that there was a desire for file-resource sharing, it seemed equally likely that there were undiscovered problems involved, and it was expedient to take up that particular area of emphasis in the workshop to uncover some of the barriers that might exist.

4. *What technical capabilities are required to facilitate file resource sharing?* This brought in the area of file-resource sharing mechanisms, which ranged all the way from the U.S. Mail to highly sophisticated computer networks.

### MARGARET PARK

Miss Park, an Information Scientist at the University of Georgia, has worked with the Chemical Abstracts Service and is presently developing and implementing file management systems and search services, particularly those based on bibliographic data for use both on and off campus. She listed some of the operating information files — Chemical Abstracts, Engineering Index, NASA, MARC — and pointed out that these were file resources available for sharing, in the context of the workshop's focus. At the University of Georgia, there is a file resource of seven or more data bases, and access to several more. The University provides its services on a demand or subscription basis, but this is not the same as resource sharing among many universities.

The Chairman listed what she considered as the major operative problems in organizing resource sharing:

- a) Standardization of files, data format, and management software;
- b) Diversity of user environments, computer systems, and resultant duplication of effort;
- c) Organizational/administrative barriers to use of resource-sharing programs;
- d) Effective dissemination of resource material through networks.

### HILARY BURTON

As a member of the Computer Services Library of the Forest Service, U.S.D.A., Mrs. Burton has specialized in personal documentation. Within the Forest Service, for example, scientists wanted cross-disciplinary access to files of information which they then wanted reorganized, abstracted, and stored in a reference collection specifically oriented to their individual needs.

In response to this approach, the library first attempted to use the station library's Book Catalog Computer Program to manage these personal bibliographic reference collections. As each collection tended to grow, however, it exceeded the capabilities of the program to provide efficient access, thereby necessitating development of FAMULUS — the personal documentation system now

operating at the center. The programs execute on several computers: IBM 360, Univac 1108, and CDC 6000 series. The system allows the user to construct bibliographic files, with or without abstracts, and to index the collection as desired. Among the more significant features of the system is the ability to edit, update, and maintain a file easily, restructuring the access paths from time to time as necessary. Future plans include the ability to use FAMULUS directly in conjunction with the Biomedical Package (BMD) for data analysis and reduction.

Mrs. Burton noted several points of interest for the file-resource group:

- a) The personal documentation approach facilitates file-resource sharing on the level at which individual scientists perform reference work — that of a task-specific basis with maximum flexibility required for file restructuring and access;
- b) The personal documentation system enables one to perform cross-disciplinary file access, and therefore file sharing, regardless of disciplinary approaches to file organization and structure;
- c) Personal documentation tends to supplement current file services available, because the user may merge citations from several secondary sources, redefining index terms and restructuring access paths in a manner more useful than the standard thesaurus approach.

### ALLEN KENT

The third member of the panel was Allen Kent, Professor of Library and Information Science at the University of Pittsburgh and Director of the Knowledge Availability Center. He also operates a large-scale file-resource sharing program based on the assumption that if graduate educational programs in a given discipline need adequate library collections to support them, then the university should be in the business of providing file services or get out of the educational program for that discipline.

He then turned to a discussion of the experiences and activities of the University of Pittsburgh in providing access to files. The cost of providing such services is prohibitive if a university attempts to undertake the acquisition and management of these files on an individual basis. Emphasis is therefore upon arranging remote access to as many large, centralized data bases as possible. For example, the University of Pittsburgh has access to the NASA file, the Chemical Information files, the Defense Documentation Center file, and the COSMIC computer programs.

Mr. Kent pointed out several problems related to file resource sharing:

- a) The difficulty of amortizing costs for purchasing file services. The center must not only pay whatever fees or royalties are imposed by the service but also assume the remarketing and maintenance costs that are related to a satisfactory university service;
- b) Content overlap between interdisciplinary files such as NASA and the Defense Documentation Center. For each, there are also differing tape formats, and levels of



indexing, requiring some transformation to a single format for efficient utility;

c) Differing depths and philosophies of indexing across the user population. Controlling vocabularies via thesauri only partially addresses the problem, resulting in either a shallow penetration into the subject matter or in weighty and generalized vocabularies. Both of these promote difficult search strategies that do not give adequate service;

d) Implementation of an effective file service often whets the user's appetite for more raw output (citations, documents, etc.) than it is possible to provide at reasonable cost;

e) The interactive approach to file-resource sharing, while enticing, is expensive and must be limited to small file subsets. User satisfaction is, therefore, difficult to maintain at a reasonable cost;

f) File service companies are moving toward a limited-access arrangement based on a royalty or leasing system that is, by and large, unacceptable to university administrators. Unlimited access and/or ownership of the data files would threaten the business of the service organizations, while leasing or royalty arrangements threaten the universities' budgets.

He summed up his presentation as being a "council of despair, which can only be approached via cooperative activity in organizations such as EDUCOM."

#### JOHN F. VINSONHALER

The fourth member of the panel, Dr. John F. Vinsonhaler of the Learning System Institute of Michigan State University, has been active in the development of the Basic Indexing and Retrieval System (BIRS). He began his presentation by addressing the problems of file-resource sharing via computer programs. He advocates the use of hardware/software/data-base combinations known as "dissemination packages" for file sharing. As principal author of the U.S.O.E. BIRS, he designed the system for portability (a kind of machine independence) and usability by non-computer-oriented educators. The BIRS system is similar to the Generalized Information System (GIS) and is operable on both IBM 360 and CDC 3000 and RCA Spectra 70 series of computers. BIRS consists of a set of programs for storage, indexing, bibliographic production, searching, and retrieval. A new set of numerical analyses and statistical report generation programs are presently being added to broaden the application of the system.

Dr. Vinsonhaler described the use of the BIRS system to exchange and manage U.S.O.E. files, specifically the Bureau of Education for the Handicapped (BEH) files, the Project Resumes Information Systems (PRIS) files, and the AID to State Information System (ASIS) files. Although each file consisted of a variety of data types, it was possible to create a "dissemination package" for each, and to implement the package in several locations,

using several different types of computers. The successful use of these packages has reduced both the cost and difficulty of sharing files by users in remote locations. He suggested that EDUCOM consider using this approach, which works as follows:

a) An archival copy (written in USASI FORTRAN) of the file management system and a program transformation system is used to create a modified operational version of the system for the required computer installation.

b) A file-duplication system is used to reproduce and verify each installation package needed before it is sent to the user centers.

c) Maintenance operations such as updating, modification or revision of the files or programs, result in a new dissemination package which is created centrally and sent out to users.

His summary stated that it should be economical for EDUCOM to share file resources through the use of computer programs and databanks utilized together in a file-dissemination package. Portable information management systems and files taken together, simplify the process and encourage the creation of standard record formats, standard thesauri, and thus cooperation. In Dr. Vinsonhaler's words, "... one effect of having a group of people share programs is to make them want to share data, and that might be the most important thing that EDUCOM could do."

#### WORKSHOP ACTION

From the discussion which followed, the basic problems became rephrased as specific questions to be answered by a panel on Libraries and Databanks:

1. Should File Resources be a separate area of development in EDUCOM or should it be operable as a part of the EIN\* program?

2. If separable, should library resources and databanks be dealt with together or in separate groups?

3. What files are presently owned by EDUCOM member institutions? Of these, how many others would like access to or service from those files?

4. How many public data bases are available for sharing?

5. What future action should be organized to facilitate file resources?

An Executive Committee was chosen to govern the work of the Panel and to coordinate the answers to the questions above. Its members are:

Mr. David Blackwell, Data Processing,  
Educational Testing Service

Dr. James L. Carmon, Computer Center,  
University of Georgia

Dr. Robert Ennen, Technical Service,  
University of Notre Dame

Mr. Allen Kent,  
Knowledge Availability Systems Center

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\*EIN — Education Information Network. See pp. 5 and 6, EDUCOM, 4:6, Dec. 1969.





Don Mittleman, Council Chairman



Don Katz, Board Chairman



Harold Wakefield, Trustee

### NEW COUNCIL CHAIRMAN

Dr. Don Mittleman, Director of the Computer Center at the University of Notre Dame, was elected Chairman of the Interuniversity Communications Council at the Fall meeting. He replaces Dr. Martin Greenberger, The Johns Hopkins University, who was then elected as a Trustee. Dr. Mittleman also becomes a Trustee, ex officio.

The new Chairman is a graduate of Columbia University, where he received his BS, MA and PhD in mathematics. He has been a teacher, and a mathematician at the National Bureau of Standards and at the Harry Diamond Labs. Entering the computer sciences, he served as Chief of the Computation Laboratory at N.B.S. and in 1964 became Director of the Computing Center at Notre Dame. He has been the Institutional Representative from the University for several years and during the last year served on the Ad Hoc Committee on Membership. Dr. Mittleman has developed a strong interest in computer art and examples of his work appeared on the covers of *EDUCOM* in February and March of this year, plus an article on the subject in the latter (*EDUCOM*, 4, 2, March 1969).

### BOARD CHAIRMAN REELECTED

At the first meeting of the Board of Trustees following the Fall Council, Dr. Donald Katz was reelected as Chairman of the Board for another year. Formerly the Vice Chairman, Dr. Katz succeeded to the chairmanship on the resignation of Dr. Thomas Hunter earlier in the year. He is the Institutional Representative from the University of Michigan, where he is the A. H. White University Professor of Chemical Engineering. He is a Fellow of the American Nuclear Society and in 1968 was elected to the National Academy of Engineering. An authority on petroleum and natural gas engineering and on engineering education, Dr. Katz has published extensively in both fields. Among his works are: *The Handbook of Natural Gas Engineering*, McGraw-Hill, New York, 1959; *Engineering Concepts and Perspective*, Wiley & Sons, New York, 1967; and "Are We Prepared to Use our Computer as an Information System?" *Journal of Engineering Education*, April 1968.

### WAKEFIELD NEW TRUSTEE

Harold B. Wakefield recently replaced Gordon Osborn as Institutional Representative from the multi-campus State University of New York. In that position he acceded to the membership on the EDUCOM Board of Trustees held by SUNY. At the Fall Council, Mr. Wakefield was reelected to continue to serve for three years as an Institutional Trustee. He is presently filling the new office of Director of the Office of Computer Systems Development for SUNY. As such, he will coordinate the use of computers for teaching, research and management. This will involve time-sharing, networks for computer-assisted instruction, library management information systems and the development of regional computing centers.

Mr. Wakefield has been associated with IBM for many years in systems engineering and marketing, and has served on various state and city educational agencies, including the New York State Advisory Council for Vocational Education.

### File Resources (Con't.)

Dr. A. Knowles, Dept. of English,  
North Carolina State University  
Mr. John McGowan, Deering Library,  
Northwestern University  
Dr. John F. Vinsonhaler, Learning Systems Institute,  
Michigan State University

Questions 1 and 2 are being assessed by the Executive Committee and will include communication with EDUCOM Institutional Representatives. The third question will be answered by a survey of all EDUCOM member institutions. Question 4 is being answered by the distribution of the J. C. Troutman *Inventory of Available Data Bases* by permission of Dr. Robert Hayes of UCLA. The last question is being considered by the Executive Committee and will also require further communication among our Institutional Representatives.



## APRIL IN BOSTON

What better time and place for EDUCOM's Spring Council? Wednesday and Thursday, 15 and 16 April; Charles River Plaza, Boston, the location of EDUCOM headquarters. Tentative plans call for the Council and general sessions to be held in the mornings in Charles Cinema located in the Plaza. Working sessions will be held in the Holiday Inn adjacent to the EDUCOM offices. The Inn will also house attendees who register in advance. Meetings pertaining to member activity in EDUCOM areas of interest, such as computer communications and file resources, will be held at different times so that all interested parties may attend. Check your future issues of the Bulletin for a complete program.

Boston offers not only many gastronomic and cultural delights, but also the opportunity to visit some of the leading educational institutions in the country. Group visits or tours to see these places can be arranged through EDUCOM.

Distribution of EDUCOM Members by State and Province

December 1969

